FOUNDRY
EST. 1902
TRADE JOURNAL
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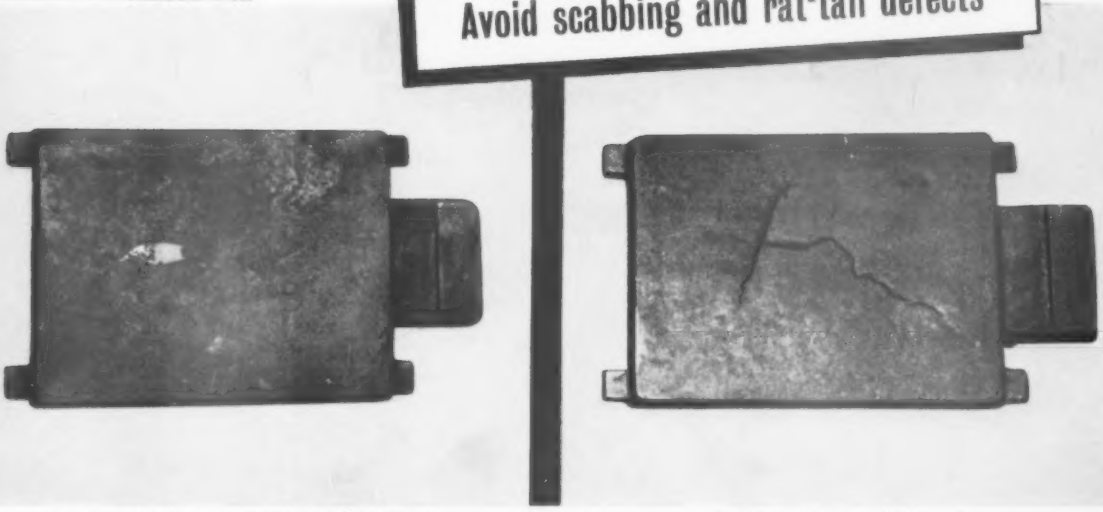
MAKE SURE YOUR FOUNDRY USES

BERKOAL

Avoid scabbing and rat-tail defects



Cast in synthetic sand containing BERKOAL

Cast in previous synthetic sand

REPRODUCED BY PERMISSION OF R. & A. MAIN LTD., EDMONTON, WHO COLLABORATED IN THIS DEMONSTRATION

These photographs clearly show the effect a small addition of (say 2%) BERKOAL has in overcoming scabbing and rat-tail defects due to sand expansion. Ask Berk for a trial delivery and full technical data.

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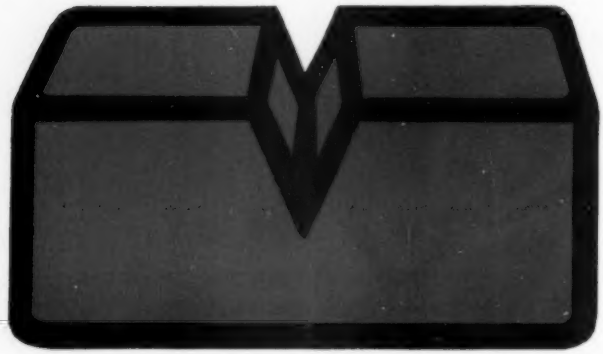

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Look at one of the new Union Carbide briquettes and you'll see what we mean by Union Carbide service. This briquette is different from the old one in many ways and every point of difference is a point in favour of the customer. We set out to make a shape that the customer would find easier to handle, check, store and charge. That kept the Development section busy. Then somebody came up with the bright idea of making it a 2 lb. briquette that would crack into two accurate 1 lb. halves. That was a headache for the Quality Control department, because each half had to provide exactly the same amount of alloy. Now look at the briquette again and you'll see that we've done all we set out to do—and, a bonus. We got the price down and passed the saving on to the customer. That's what we call service.

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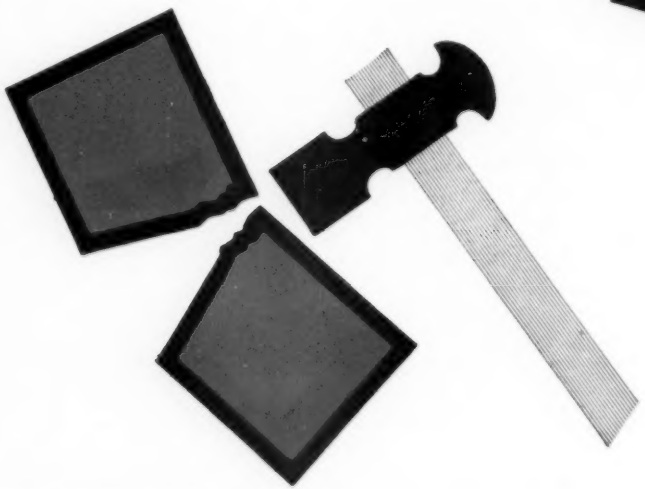

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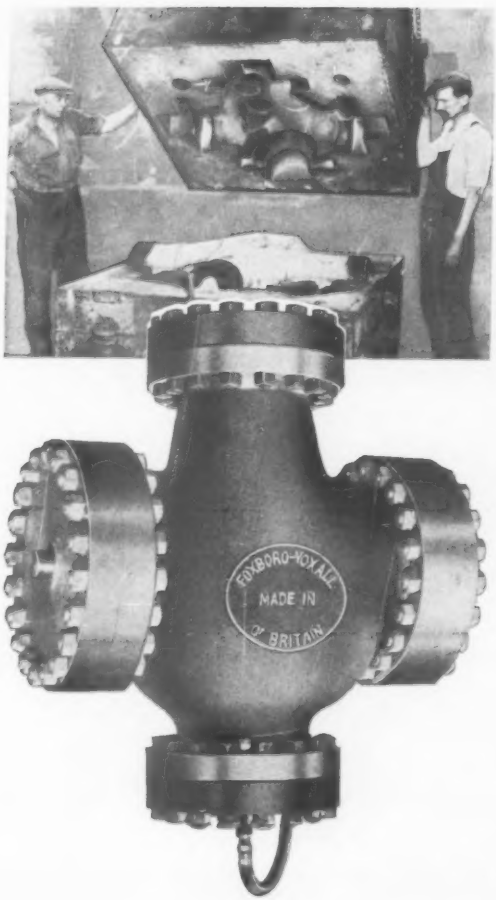

Carbon steel valve casting, weight 3 tons, tested under pressure at 2,000 lbs per sq. in., for oil-installation. Photo of core and casting by courtesy of Messrs Lake & Elliot, Ltd., Iron and Steel Founders, Braintree, Essex.

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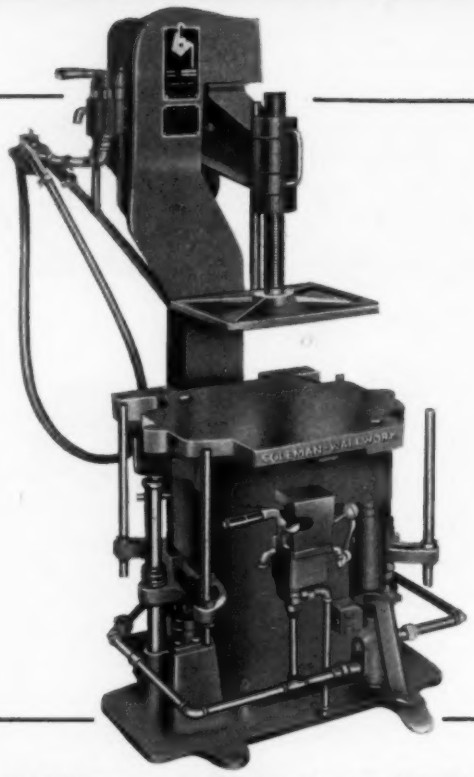
WT563C

This machine, with its table size of 35" x 24" and useful load of 800 lbs., has all the advantages of the WT.563 machine plus a larger capacity. A wide range of moulding boxes and pattern plates can be accommodated and boxes of varying depths utilized. Pattern-plate change is simple and rapid.



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THE COLEMAN WALLWORK FOUNDRY EQUIPMENT DIVISION OF STONE WALLWORK LIMITED

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"Heaven help us if we carried on that sort of caper at AW. Customers don't want firms that are up one minute and down the next. When buyers come to a company with our reputation they expect—and get—a reliable performance. Fancy telling them that a load of pig wasn't up to specification because one of our furnacemen was off form!

"I reckon I'd get a coupon up every week if footballers were only half as consistent as the AW team."

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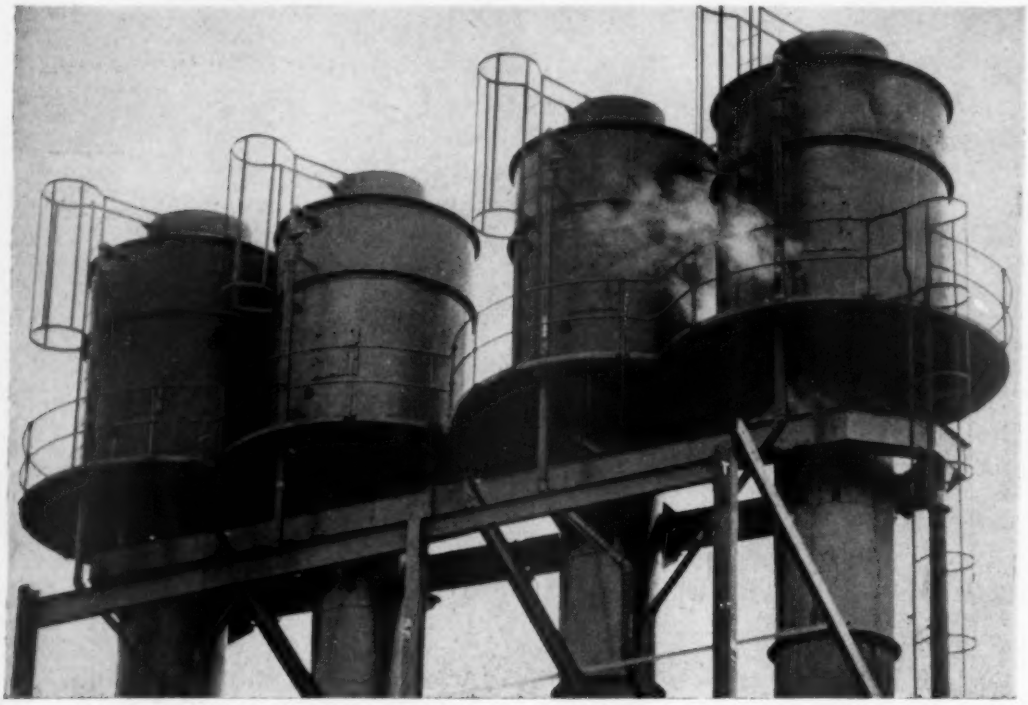
A2

DUST ARRESTERS



Photograph by courtesy of R. J. Hunt & Sons Ltd.

Here is a recent installation on 4 existing cupolas, adding to the impressive number of INCANDESCENT-WHITING wet type dust arresters now working in this country. The experience gained over many years with this type of arrester is available to solve *your* particular problems. Why not ask for an engineer to call or better still write today for leaflet FP.2.

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Because Roper productions are more than efficient they are reliable in operation

Illustration on left, a Wet type Spark Arrester with Inspection Platform serving a 17 ton per hour Cupola.

At right is shown Spark and Dust Suppressor with a Spray Jet giving a double water curtain.

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Photographs by courtesy of BILSTON FOUNDRIES LTD.

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The first pair of electrically heated stoves for drying roll moulds and chills, which were specifically designed for a famous Scottish Roll Foundry, have just completed their first year in production, and have proved to be the answer for which rollmakers everywhere have been looking—to avoid contamination of chills, and prevent porosity in the finished casting.

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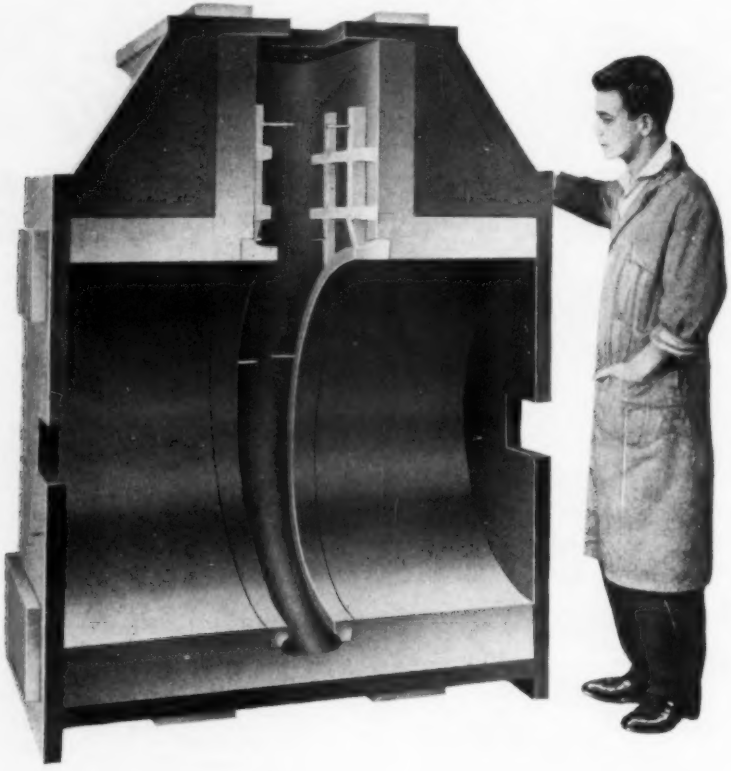

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APL49

O.M. S.p.A. of Milan use Foseco*

methods in the production of light alloy castings for diesel locomotives

Photo by courtesy of O.M. S.p.A., Milan.

Shown above is the O.M. Locomotive Works, Milan, Italy where diesel locomotives are made for export all over the world ... and Foseco products are always first choice because of their unvarying reliability.

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- High capacity cupola blowers
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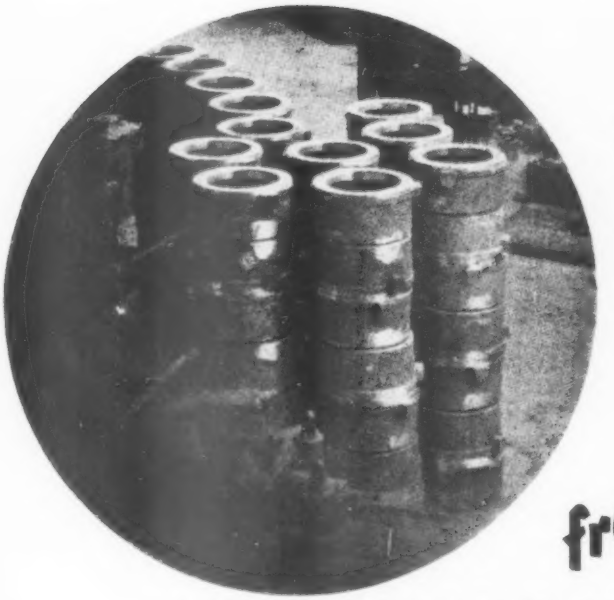

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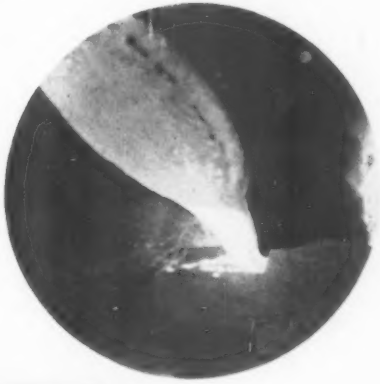

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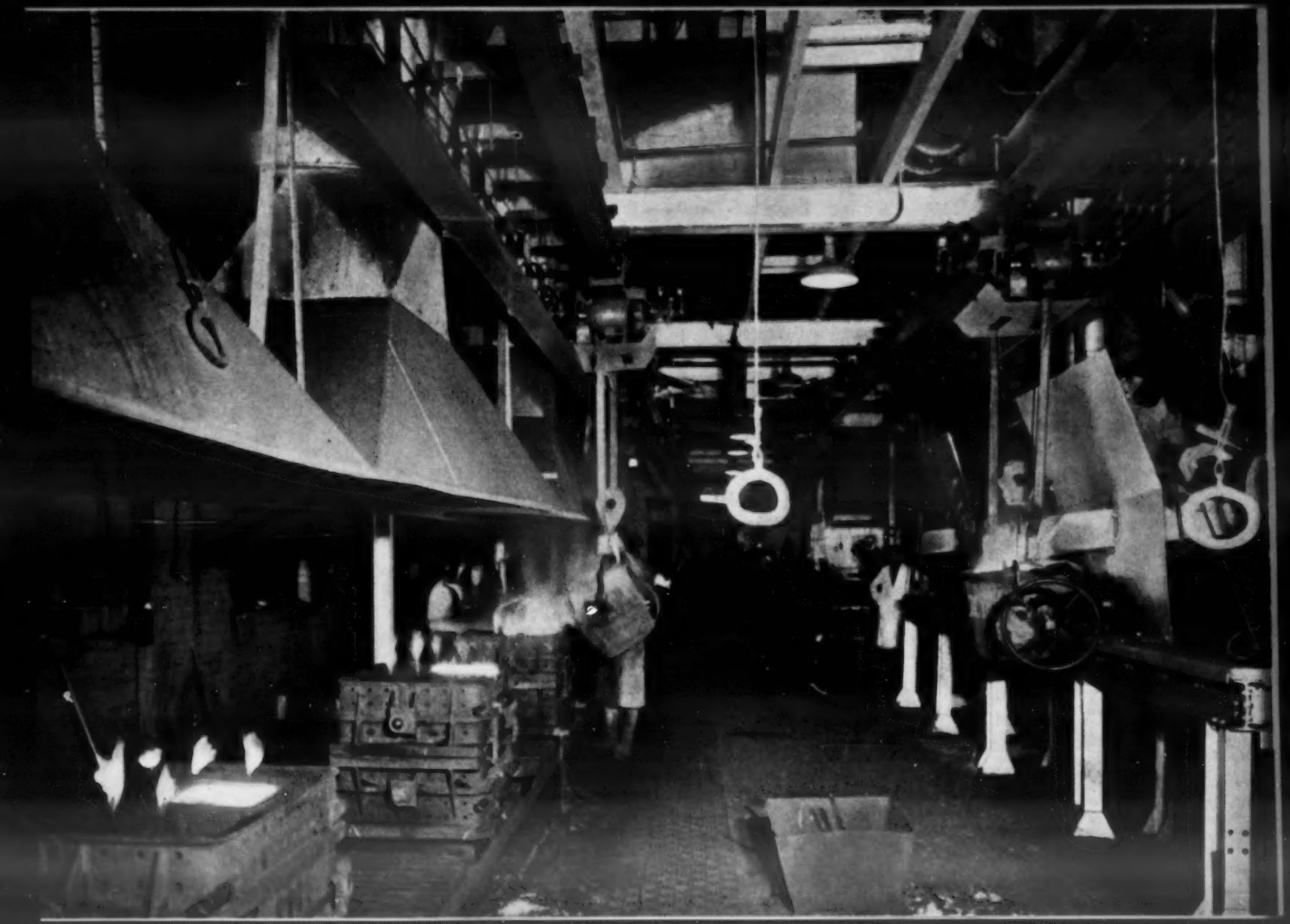
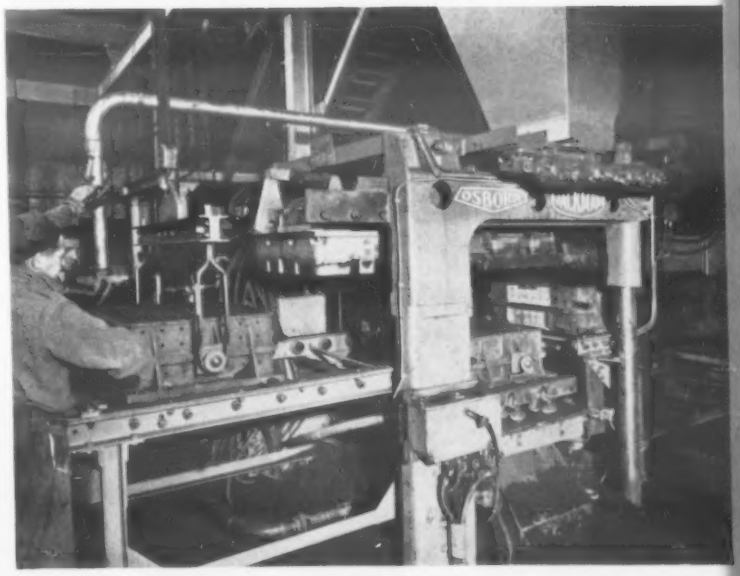


Sterling boxes help to build BMC parts at Wellingborough

Sterling boxes are used in conjunction with these new semi-automatic machines recently installed at Messrs Morris Engines Foundry at Wellingborough. The machines are capable of an output of sixty complete moulds per hour, and the boxes used are of the famous Sterling heavy duty type designed to resist very high moulding pressures and stresses, and ideal for operating in mechanised foundries.



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CORVENT venting tubes entirely eliminate blowholes. Made from a special textile material, the flexible open-weave tubes permit rapid escape of gases from the start of the casting process. There is no messy wax to soak into the sand and cause blowholes. **CORVENT** is also ideal for CO_2 gassing of cores and moulds.

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These are illustrated, the second Cupola from the left is "blowing" —note the complete absence of dark smoke, sure proof of efficiency.

Photo completely untouched taken during normal operating conditions.

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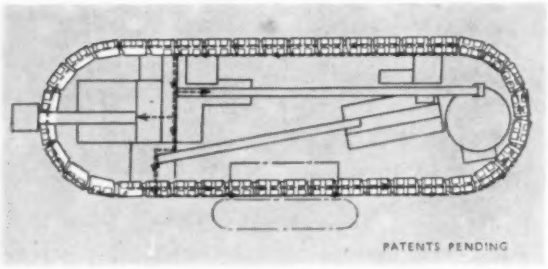

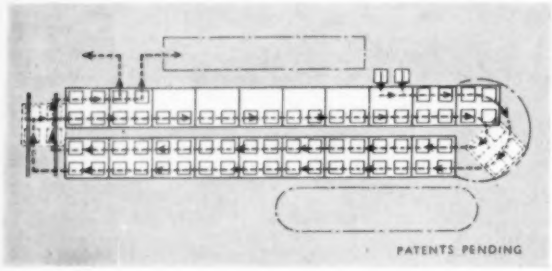

"Double MRI" Mould Handling System

Rectangular loop, consisting of two straight runs connected with a rotary turn and transfer car. Cars advance one car length, then remain stationary for timed period so large moulds can be loaded onto the conveyor, poured, and the moulds removed, while the conveyor is stationary. Moulds are carried side by side on the cars and make almost two complete trips around the loop, thus nearly doubling the cooling time per square foot of floor space.

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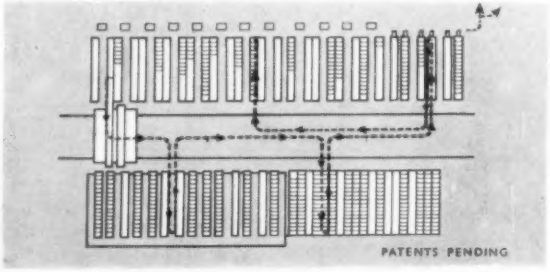
Unlimited flexibility for jobbing foundries. The transfer car delivers pallets loaded with similar moulds, to the pouring, cooling, and shakeout zones, and returns the pallet with the bottom boards and bands—or flasks—to the moulding area. Handling similar moulds together permits moulds for different castings to be kept separate, and even poured with different metals, without interfering with other groups of castings. Slow jobs do not hold up the fast jobs. Moulding, pouring, cooling and shakeout are centralized, minimizing the equipment requirement.



Write today for a copy of Bulletin No. 135. It gives full details about eight different types of Bartlett-Snow Mould Handling Systems.

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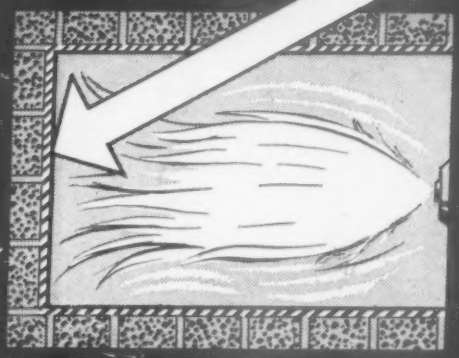

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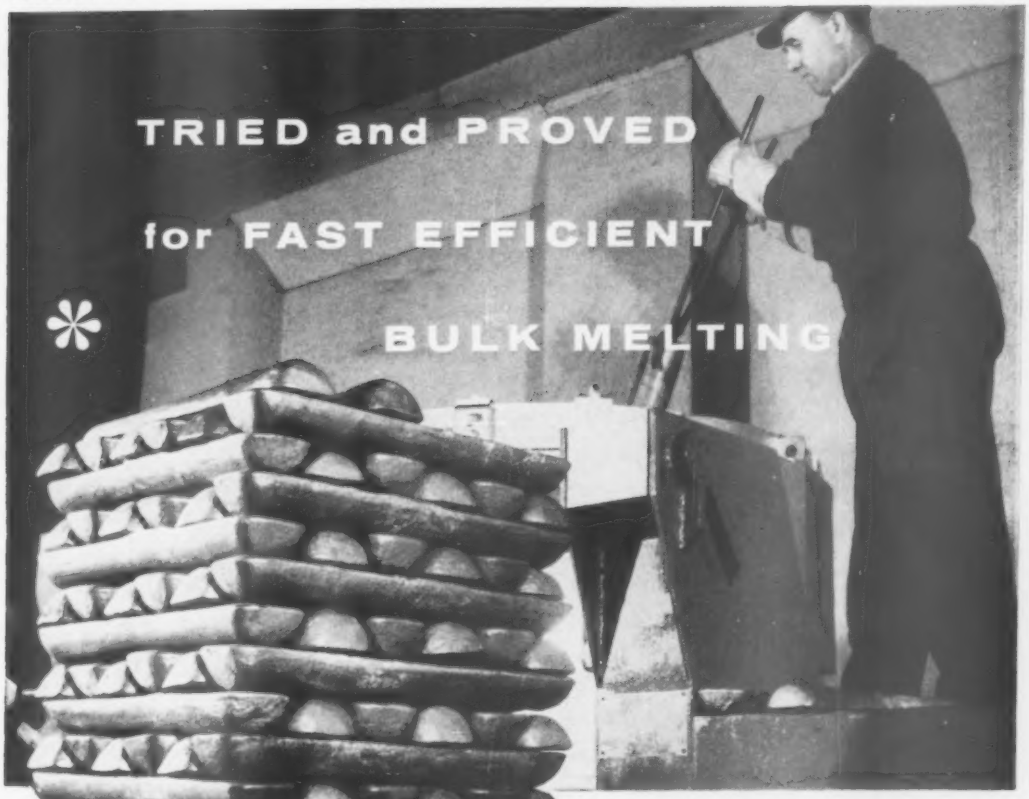

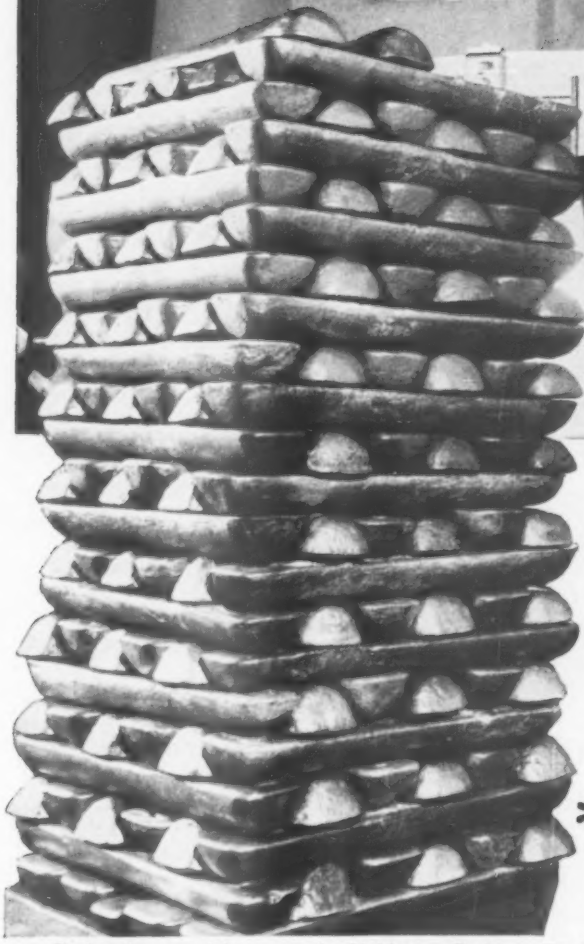

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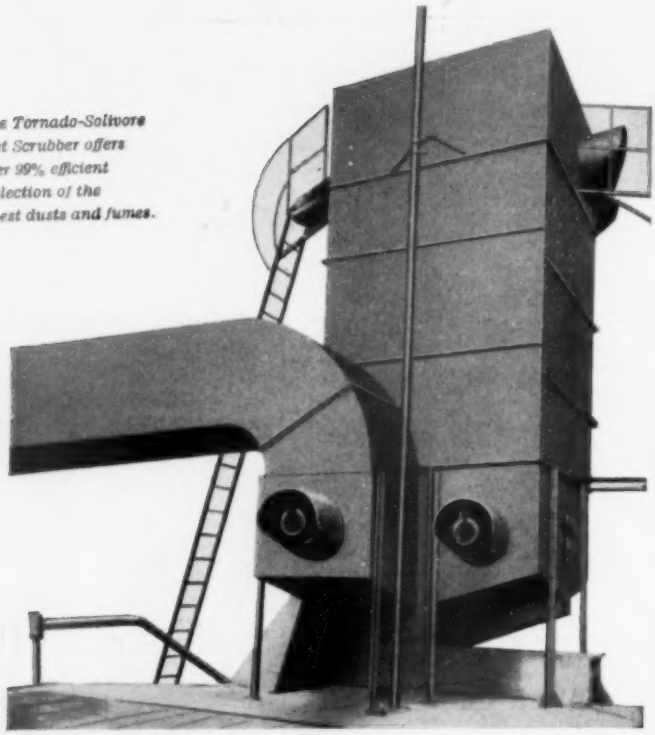

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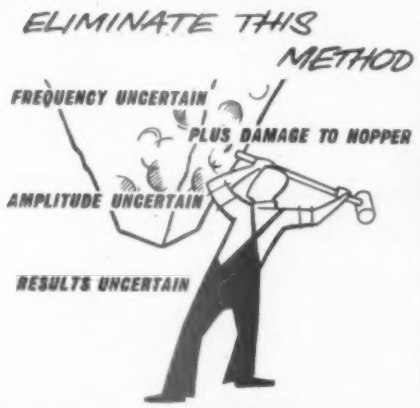

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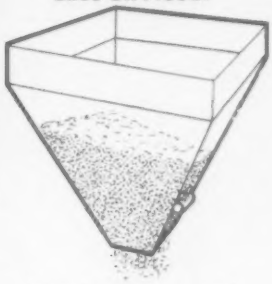
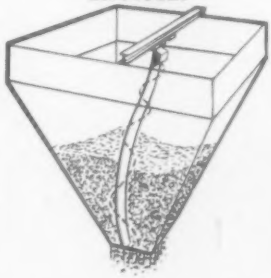


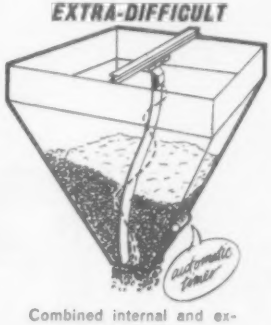
External vibrator on steel hopper.

DIFFICULT



Vibrating reed. Used where external vibration is impractical, i.e. concrete hoppers and difficult structures.

EXTRA-DIFFICULT



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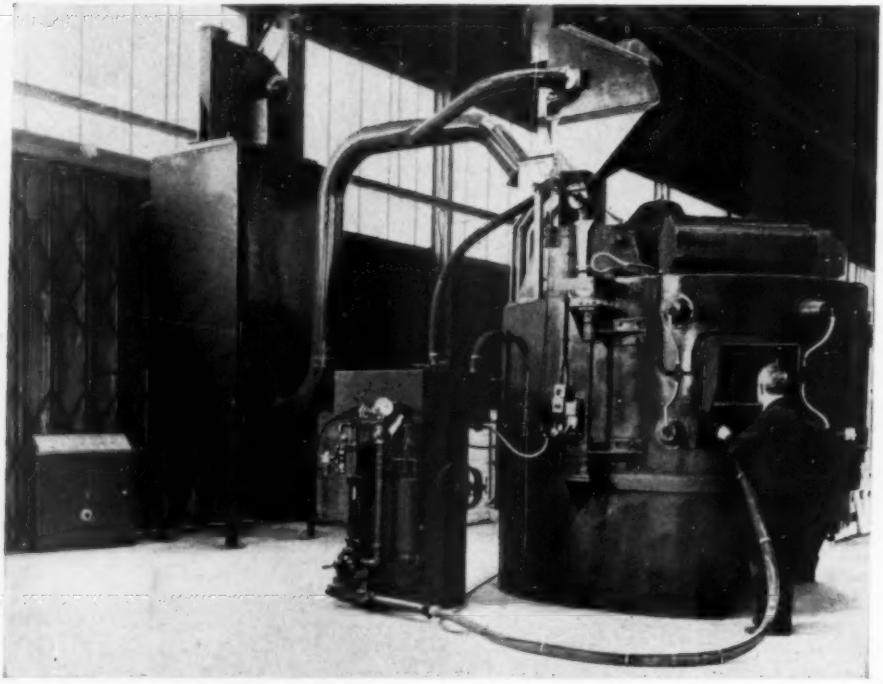

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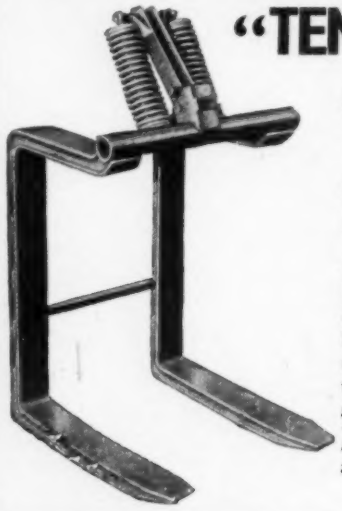

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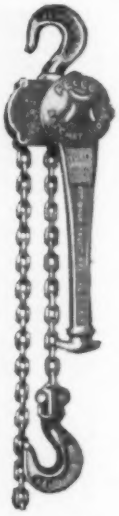

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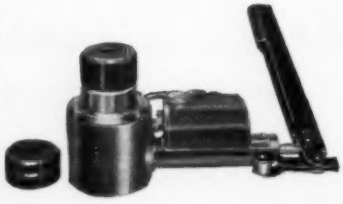

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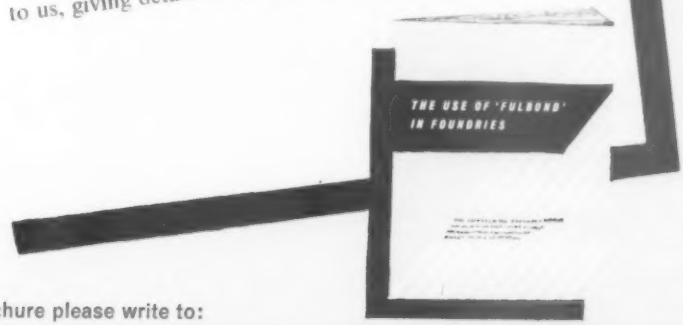

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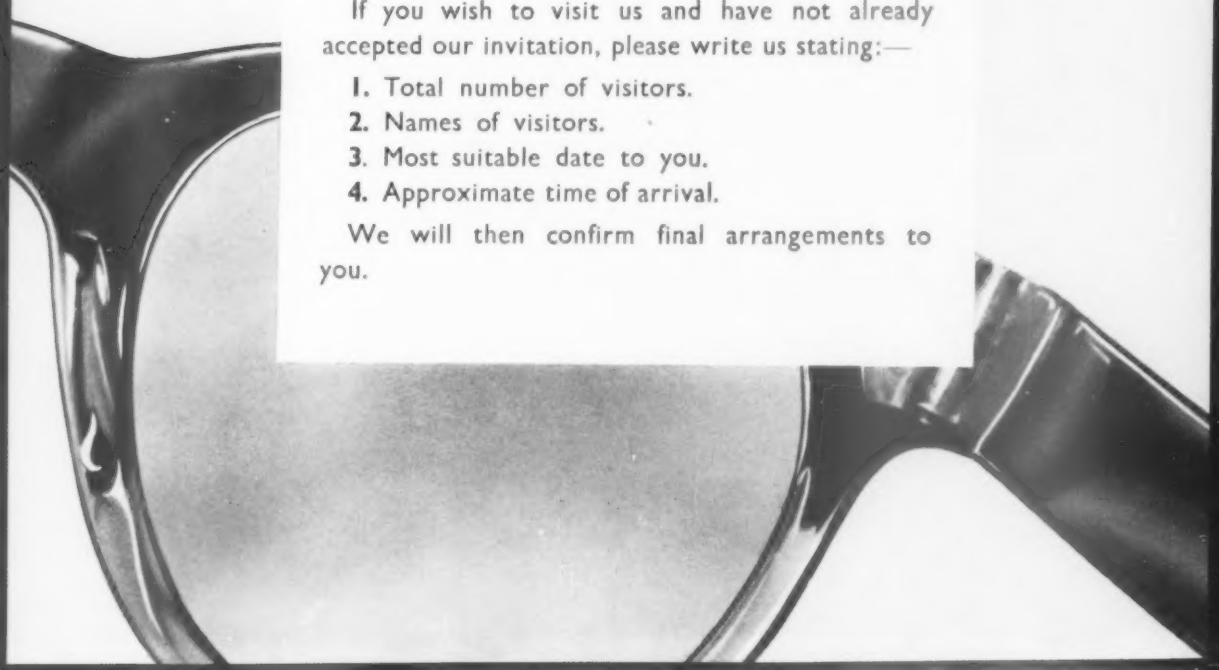

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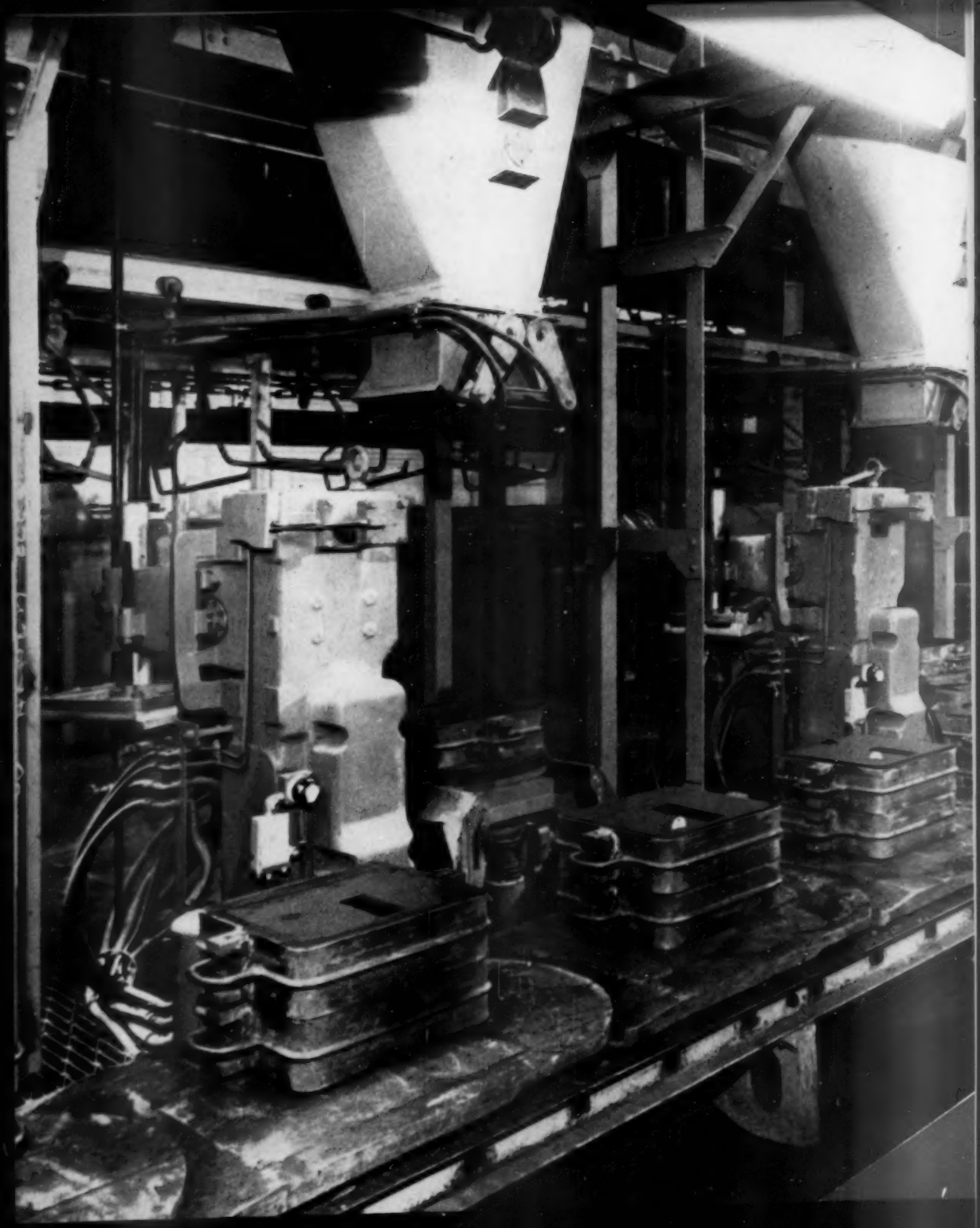

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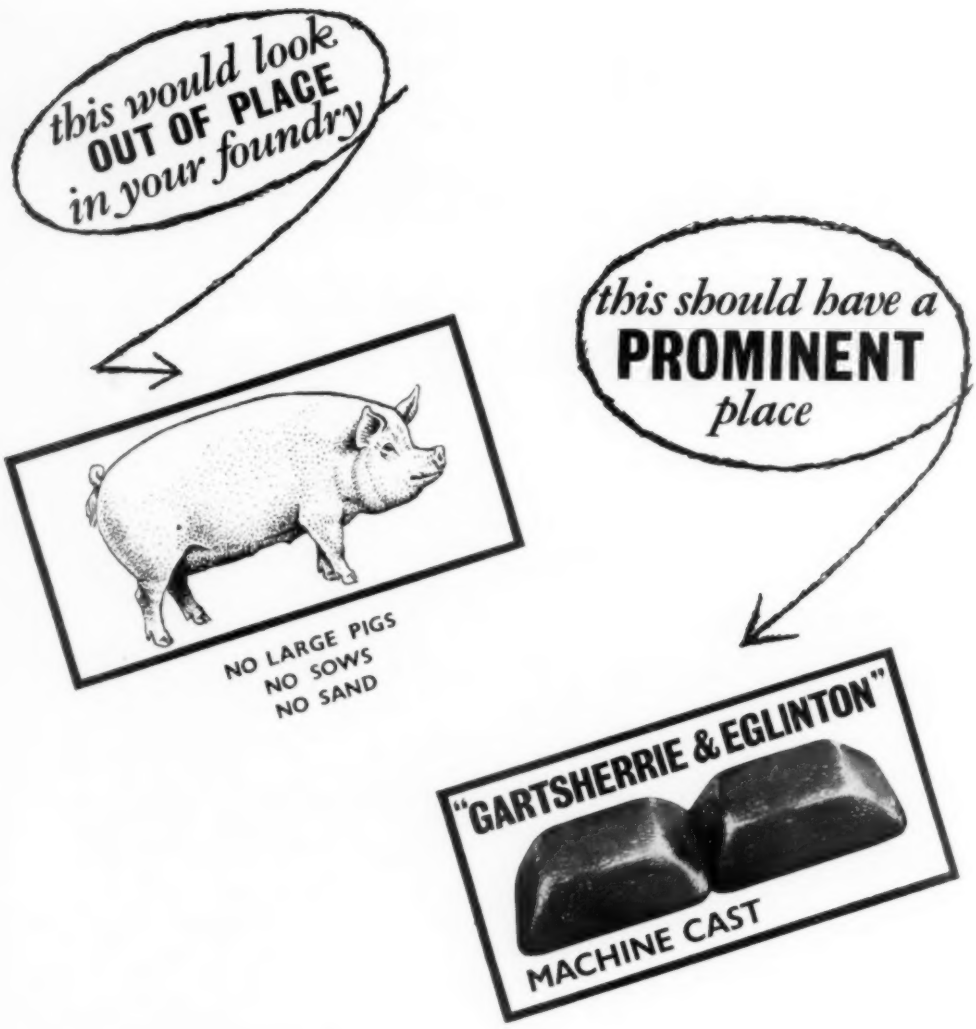

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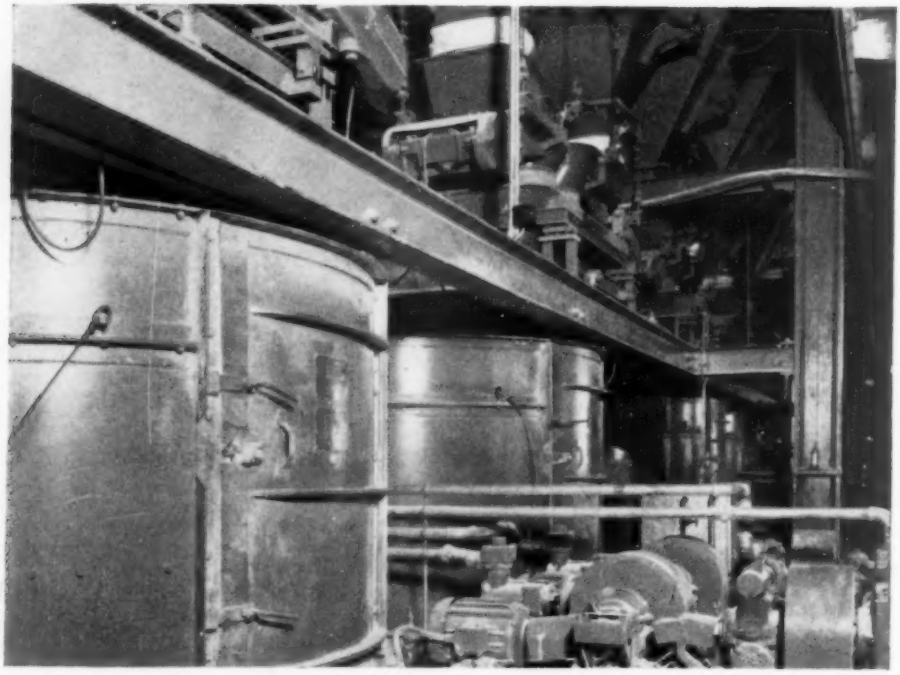

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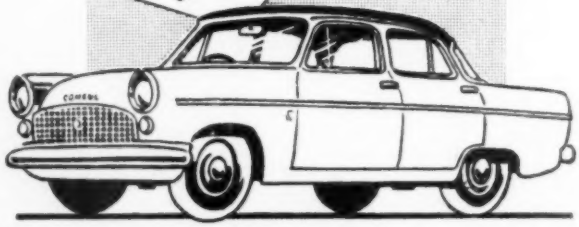

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FOUNDRY
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The Industry's Share in a National Effort

The Commonwealth Technical Training Week* sponsored by H.R.H. the Duke of Edinburgh will be held throughout the country during May 29 to June 2. The foundry industry is participating in this effort, and the work of the various trade associations will become evident later, particularly that of the Council of Ironfoundry Associations. At present we would like to draw attention to the proposals of the National Foundry College in this connection. During the whole of the week, the departments of the College will be open for inspection, with illustrative exhibits and films. Students of the College will operate the equipment, particularly in the foundry, and the staff, all of whom have practical experience in the industry as well as appropriate teaching qualifications, will be available to explain matters to visitors. All those concerned with the industry, in all its branches, ferrous or non-ferrous, together with suppliers of materials, equipment makers and users of castings will be welcomed during this period. On Friday, June 2, a meeting will be held in the hall of the adjoining Wolverhampton and Staffordshire College of Technology, when Sir Cyril Musgrave, chairman of the Iron and Steel Board, will present diplomas to the students successful in the last session. Sir Cyril will be introduced by Sir Frederick Scopes, chairman of Governors of the Foundry College, which will of course be open for inspection before and after the ceremony.

The regular Diploma course of the College is now quite wellknown; it comprises six months in the College, six months back in industry, followed by a year in the College, the successful completion of which entitles students to the College diploma. Less wellknown is the fact that, each session in the final year, upwards of 90 lectures are given by over 40 experts drawn from the foundry industry, and that during the two parts of the course the student visits about 70 foundries, of all kinds.

In September, 1960, a Sandwich Course was established of three years duration, half to be spent in the College and half in the industry; successful students attending this will receive the Advanced Diploma of the College, the highest qualification available in the country in foundry technology. The entry qualifications differ from those for the ordinary Diploma and indeed are equivalent to those required for a Dip. Tech. course. This scheme, too, is making worthwhile progress which will become more and more evident as time passes. All these activities deserve the study and support of the industry as a whole; in their implications they are of real national importance !

* See page 522 of this JOURNAL

Correspondence

BRASS AND BRONZE FOUNDING

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In your correspondence columns in the JOURNAL of April 6, you print a letter from Mr. W. R. Buxton, vice-president of the Association of Bronze and Brass Founders, commenting on the assistance given to the American foundry industry by the American Bronze and Brass Ingot Institute through sponsored research work. I agree wholeheartedly with the tenor of Mr. Buxton's appeal to the bronze foundry industry to raise the level of its technical standing, but there is one comment, on research in this country, in Mr. Buxtons' letter, that may give a wrong impression. In referring to the researches carried out for the bronze founders in this country, he says that, because the work is carried out by the British Non-Ferrous Metals Research Association, the results must be made available to the industry as a whole. This statement is not quite accurate. The fact is that the results of research carried out by the BNFMRA are always released in the first place in the form of reports which are confidential to the Association's members. The results are not published, except after seeking the views of interested members, and in any case there is usually some delay between the release of the results to members and open publication.

It so happens that much of the recent research work carried out for the bronze foundry industry has been such that members themselves can only profit from it if the results are generally available. For example, work on the development of improved gunmetals can only bear fruit if the users of castings are made aware of the advantages of the improved materials and specify these when placing their orders. The same applies to work on the effect of impurities in gunmetals, which can only help the industry if taken account of in preparing the relevant standards. These are only two examples of the need to make the results widely known in order that members themselves may profit from them.

With other work for the bronze foundry industry, the interested members have so far pursued a very liberal policy regarding publication—witness the number of BNF papers contributed to conferences of the Institute of British Foundrymen in recent years—but there is no *must* about this and members are entitled to object to publication of the work if they think fit.

Funds contributed by the bronze founders and ingot manufacturers do not, by any means, cover the cost of the foundry researches being carried out at the BNF. They are at present supplemented by contributions from the copper producers—one of the suggestions Mr. Buxton makes for increasing funds for research—and also by contributions from the engineering industries who are users of castings. Yours, etc.

E. C. MANTLE,
Chief Liaison Officer.

British Non-Ferrous Metals Research Association,
Euston Street,
London, N.W.1.
April 18, 1961.

Latest Foundry Statistics

Ironfounding: During the week ending February 25, there were 131,082 people employed in iron foundries in the United Kingdom, states the Council of Ironfoundry Associations in its latest report. A month earlier there were 131,395 and in February 1960, 129,012.

Commonwealth Training Week

On May 29, Commonwealth Technical Training Week begins in Britain and many other parts of the Commonwealth. The idea, which came from H.R.H. Prince Philip, Duke of Edinburgh, after he saw a similar scheme in operation in Australia, is to stress the importance of vocational training for young people, whatever job they are going in for.

Despite the use of the word "technical" in the official title the celebrations are not confined to apprentices, apprenticeship schemes or industrial training. They are neither a campaign to encourage skilled workers to emigrate, nor a labour-recruitment drive. The "Week" embraces all forms of vocational training and education, including agriculture, commerce and the professions. The plan—which is quite comprehensive in its concept—is to make the entire Commonwealth aware of the British nation's responsibility towards the young man or woman trying to find a niche in life.

Each of the 37 Commonwealth countries (including Britain) taking part in the project is responsible for its own arrangements. Some—particularly those in very hot climates—are holding their Training Week activities earlier than the generally-agreed period of May 29 to June 4. In Britain, Prince Philip has asked the City and Guilds of London Institute—of which he is president—to be an over-seeing, co-ordinating body, but detailed organizing of the Week in the UK is in the hands of local authorities. Almost all county councils and county boroughs have asked their education committees to be responsible for events but the actual arrangements are in general being made by youth employment committees, technical or training colleges.

Starting at the inauguration ceremony in London's Guildhall, Prince Philip is giving all his time to the Week's events, which are so widespread that his crammed schedule will be made practicable only by extensive use of aeroplane and helicopter. He will be visiting Belfast, Glasgow, Edinburgh, Birmingham and Cardiff, returning to London for a Commonwealth apprentices' service at St. Paul's Cathedral on June 1. Throughout Britain there will be civic functions, careers exhibitions and conventions, open days at colleges and big industrial concerns, exhibitions of work, prizegivings, sports and social functions, shop-window displays, film shows, entertainment and hospitality for the country's younger generation.

NSMP Notes

The *Fédération Francaise des Patrons Modeleurs-Mécaniciens* (French Master Patternmakers Association) have invited a small delegation of members of the National Society of Master Patternmakers (accompanied by their ladies) to join in their annual conference which is to be held from May 11 to 14 at Nice. At the gathering, the NSMP senior vice-president, Mr. R. W. Mousley (Leamington Pattern Making Company, Limited) will deputize for Mr. E. C. Rowen, the president, and Mr. J. Harvey (J. J. Harvey & Pressurecast, Limited), is also expected to attend. The visitors will participate particularly in a session devoted to the exchange of views on the problems of patternmaking and possible co-operation between various national associations for patternmakers. They will arrive in Nice at mid-day on May 13, and stay until Sunday evening, May 14.

LEEDS FIRECLAY COMPANY, LIMITED—Mr. R. G. Parker has been appointed a director.

Production of Blackheart Malleable

Survey of Countrywide Activities Prepared by our American Correspondent.

The active co-operation of the Malleable Founders' Society of the US has been obtained in the compilation of this review of malleable practice and prospects in America. The position of malleable in the US is of great interest to readers in other parts of the world particularly in view of the larger weight of malleable castings used in American automobiles than in other countries. Against this background also the current situation with regard to growing adoption of nodular iron and aluminium in the automobile field and the potential threat this holds for malleable enhances the value of the review just at this time. There is also a brief survey of control methods etc., in the American blackheart field complementary to that of US steelfounding, published in the JOURNAL quite recently.

The process of malleablization which Reaumur described in 1720, 1721 and 1722, consisted of melting iron, pouring castings, packing them in pulverized iron ore, and heating them to bright redness for many days. The metal thus produced was almost free from carbon and for the first time provided ferrous castings possessing some toughness and ductility. This process, with only minor deviations, has been followed in Europe to the present day in those foundries still producing whiteheart malleable iron.

Whiteheart malleable never found much use in America; only one or two foundries were still making it as late as the end of the nineteenth century. The prinicpal importance of Reaumur's achievement, is the fact that it set a mark for another creative mind to shoot at, a century later.

Origin

At Newark, New Jersey, in 1820, Seth Boyden had set up an iron foundry. Knowing of the whiteheart malleable iron of Europe, he foresaw in the rapidly-developing industries of his own country a potential market for such a material. On the fourth of July, 1826 he set out on a series of experiments to find out how to make malleable-castings. From the start of his investigations until September 1, 1832, he kept a diary, recording his experiments individually, detailing the materials he used, and commenting explicitly on the results he attained. In 1831, he was granted the first American patent for malleable iron. It is plain from the record that his aim was to duplicate the whiteheart malleable iron of Europe. Because of the chemical composition of the pig irons available to him, Boyden's white iron contained less sulphur than Reaumur's, more manganese, and much more silicon. Boyden derogatorily described the fractures of his specimens as "black" and "grey."

Without realizing it, he was witnessing and recording the results of an entirely-new process—the graphitization of hard white iron to malleablize it, rather than decarburization. His iron had much better properties, and was in fact a new creation among ferrous metals—"blackheart" malleable iron, which, when broken, shows a dark velvety surface. It has often been termed American malleable iron in distinction from whiteheart malleable as made in Europe.

Development

The westward expansion of the country, with widespread building of railroads and a tremendous increase in the manufacture of agricultural implements, meant a growing demand for malleable iron. By 1850 a dozen or more malleable-iron foundries had sprouted westward from their Eastern seaboard origin, and by 1900, malleable was providing a tough casting material for the country's growing transportation industry. Recent statistics relating to the strength of the malleable foundry industry are given in Table 1.

Today, malleable products are made in a hundred or more plants located in the principal industrial areas of the US. The plants vary in size from those making a 100 tons monthly and designed for the efficient handling of relatively small orders to those producing several thousand tons monthly and mechanized for large-quantity, continuous production (Table 2).

Melting

Boyden's first melting equipment was a crucible furnace, which was soon followed by an air furnace of a half-ton capacity, in which the charge was melted in a shallow hearth by flame drawn across it from fuel in the firebox at one end of the hearth to a stack at the other. Eight batches

TABLE 1.—*Number of Malleable Foundries.*

1959.	1957.	1955.	1953.	1951.	1949.	1947.	1945.	1943.	1941.
124	124	130	137	161	154	150	156	141	155

Production of Blackheart Malleable

a day were sometimes taken from this furnace, which was not tapped, but was emptied by the moulders, who dipped out molten iron in clay-washed ladles. About 1832 when he built the air furnace, Boyden employed 60 moulders.

Most of the melting in malleable-iron manufacture today is done either directly in a horizontal-hearth furnace, commonly called an air furnace, or in an electric furnace—direct or batch melting—or by a duplexing operation in which the charge is initially melted in a cupola and the resulting molten metal is transferred to an air furnace or an electric furnace to be refined and elevated in temperature. Whether direct melting or duplexing is used is governed by the volume of metal required, and whether pouring must be on a continuous basis. For quantities up to about 50 tons per day, direct melting in an air furnace or an electric furnace is more economical than duplexing. For greater daily volume, duplexing is preferred, not only because of some economy in melting the large tonnage, but also because large production plants have continuous-conveyor moulding and must have metal continually available for pouring. As a result the greater proportion of the total tonnage of the industry is produced by this method.

Melting involves close control of the raw material and fuels. The molten end-product itself runs a gauntlet of shop tests before casting. For this reason, very little all-cupola melted malleable is made. Specifications have become strict enough to rule out its ability to qualify for most applications. ASTM Specification A-197 states that the iron shall be made by the cupola process and —*inter alia*—that castings shall be free from graphite, and that various tests specified for tensile, yield point, and elongation shall be met. Duplexing cupola to air-furnace still provides need for cupola use and the close control of raw materials continues. Coke should be low in ash and sulphur, high in thermal units and hot strength. Charging stock should be low in phosphorus and sulphur, as well as free from contaminants such as Cr, Ni, Cu, Pb, Sn, etc.

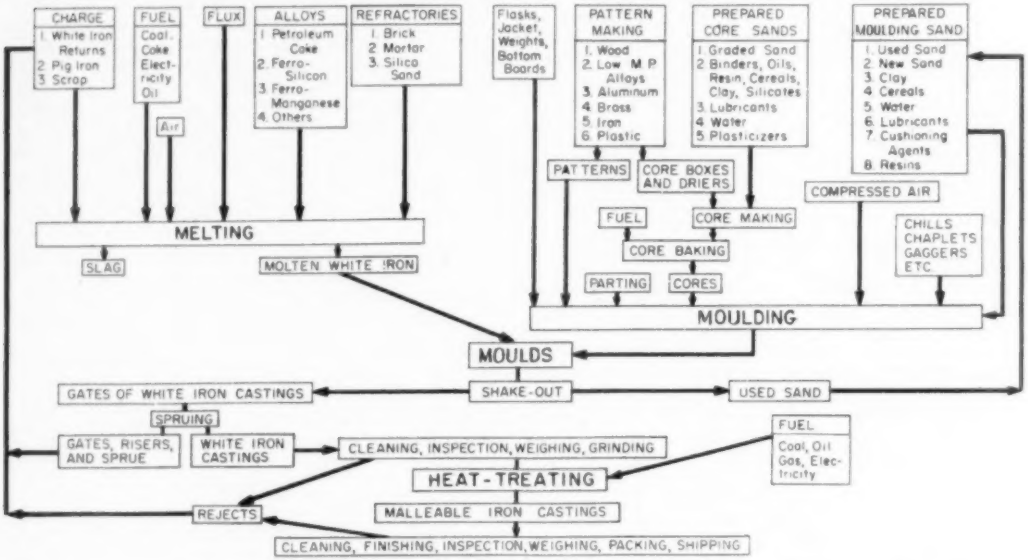

FIG. 1.—*Flow chart showing various raw materials and fundamental manufacturing steps necessary for the production of malleable-iron castings.*

TABLE 2.—*Malleable Castings Production in the US.*

	Total (tons) (includes pearlitic).	Pearlitic (tons).
1960	825,000*	190,000*
1959	916,000	186,494
1958	660,650	120,050
1957	862,976	149,437
1956	951,868	138,960
1955	1,104,775	154,274
1954	822,016	84,500
1953	970,506	69,000
1952	926,120	59,310
1951	1,085,241	59,500
1950	942,224	46,059
1949	722,898	32,850
1948	941,184	39,632
1947	898,800	32,802
1946	752,028	23,500
1945	790,731	27,500
1944	878,233	
1943	844,639	
1942	746,008	

* Estimate.

Cupolas may be equipped with hot-blast accessories and often with blast de-humidifying equipment. Liquid metal from the cupola may flow into a receiver for subsequent re-flow down grade to the air furnace or it may flow directly into the air furnace from the cupola spout in specific duplex operations. The air furnace is usually fired with powdered coal, but oil-fired operation is occasionally economical and facilities for choosing one or the other are installed in special cases.

Low-grade coal was at one time promoted as a low-cost means for balancing the cost of pulverizing, but experience seemed to eliminate this factor as an advantage. Melting operations in the final or "holding" furnace may be manipulated to adjust the composition of the metal and metal ingredients added or eliminated as control-tests indicate. Control tests usually include a chill test wedge or 2-in. dia. slug which is broken to read the fracture for evidence of "mottle" and a temperature or "degree of superheat" test made by timing the filming rate of a spoonful of liquid metal as it cools in still air. Occasional fluidity (spiral) tests may be made as a control factor. These requirements differ in the separate shops because base metal carbon contents, for example, may range from 2.40 to 3.0 per cent. total carbon.

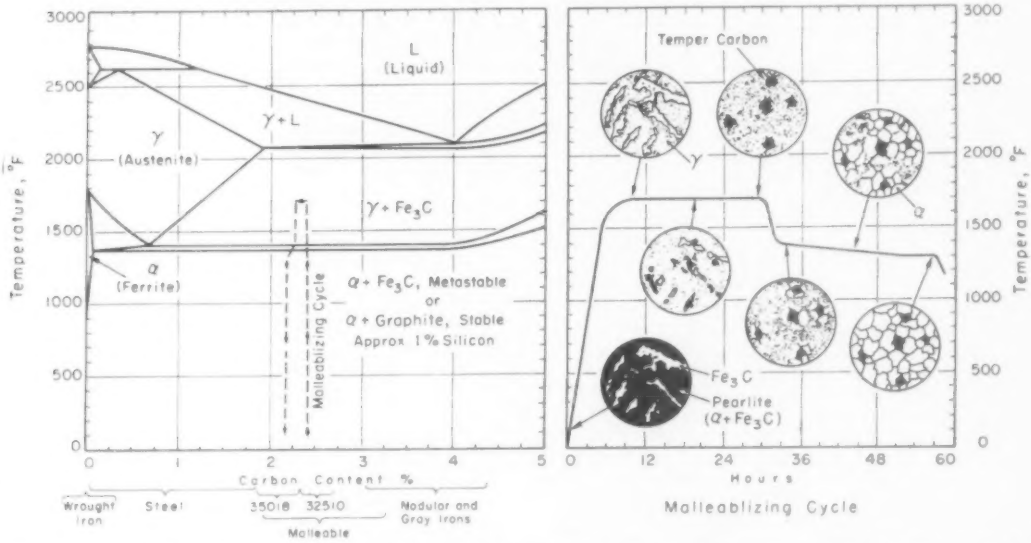

FIG. 2.—*Constitutional and heat-treatment diagrams for malleable iron. The malleablizing cycle is superimposed on the constitutional diagram on the left, while the change in microstructure as a function of the malleablizing cycle is depicted in the right-hand sketch.*

TABLE 3.—*Typical Weight Charges for Batch Melting and for Duplexing.*

	Batch melting* (air furnace).	Duplexing (cupola).
Pig-iron	25 to 35 per cent. by weight	0 to 15 per cent. by weight
Sprue	45 to 55 per cent.	45 to 55 per cent.
Malleable scrap	5 to 20 per cent.	5 to 10 per cent.
Steel scrap	0 to 10 per cent.	25 to 45 per cent.
Fuel:		
Coke (lb. per ton melt)	0	160–240†
Coal (lb./t. melt)	700–1,000	180–220‡
Electricity (kw. per ton)	0	480§
Flux (lb./t. melt)	0	60–80

* In electric-furnace batch melting, the percentage of steel scrap is usually substantially higher and the percentage of pig iron substantially lower than these values.

† Depending on the design and operation of the cupola, and on whether hot blast is employed, the latter considerably reducing the coke requirement.

‡ Where air furnace is second unit of duplexing equipment.

§ Where electric furnace is second unit of duplexing equipment.

"t" = 2,000 lb. ton.

Production

The factors involved in malleable production are shown in Fig. 1. Malleable-iron castings range in weight from a fraction of an ounce to several hundred pounds and are generally made in large numbers of a single design. The industry has great opportunities for the use of mechanization and automation in its moulding operations. Of the dozen or more basic types of moulding, the two chiefly employed in malleable manufacture are greensand and shell-moulding. The fact that malleable-iron castings are often made in large numbers from a single design provides an opportunity for the use of multiple moulding, or stack moulding, an elaboration of the greensand process. Shell-moulding is especially adapted to high-production runs and lends itself well to the manufacture of castings in which close tolerances are

required, where it reduces machining. Excellent surface finish is inherent in the shell-moulding process, which offers additional advantages because of its adaptability to mechanization.

Sand

Malleable-foundry moulding sands have received a great deal of study in the US and the results cast its benefits upon the foundry industry as a whole. The properties of principal importance are flowability, green strength, dry strength, hot strength, permeability, thermal stability, and refractoriness. A representative malleable-iron moulding sand mixture follows the ensuing typical composition:—

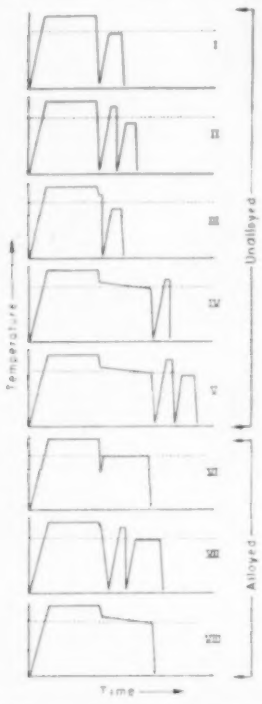

FIG. 3.—*Sketches showing schematically the cycles commercially employed in the production of pearlitic malleable iron.*

(1) Silica sand, 40 to 150 AFS grain fineness. (2) Bentonite, southern and western; four per cent. of sand weight. (3) Sea Coal; about four per cent. of dry sand weight, or enough to maintain four to five per cent. combustibles which will be burned out and increase ease of freeing the casting from the sand. (4) Moisture; in proper amount to make the mix workable—some three to six per cent.

Various additional ingredients are often added to green moulding sand such as wood-flour, ground cellulose, processed cereal hulls, and mineral perlite, finely-ground corn flour or fine corn starch, silica flour, iron oxide, etc. The most widely used additive is a special bituminous coal ground to a fineness greater than that of the moulding sand itself, and known as sea coal. It is employed primarily to improve the surface finish of castings and the ease with which they can be cleaned. Gilsonite, pitch, graphite, or proprietary hydrocarbons may also be used for the same purpose.

Controlling the colloidal binders in moulding sand by regulating the pH value has been found effective. The addition of 0.015 per cent. sodium carbonate to a normally-acid moulding sand, for example, was found to increase the pH from 6.30 to 6.78 and to raise the green compressive strength from 6.4 to 9.9 lb. per sq. in.

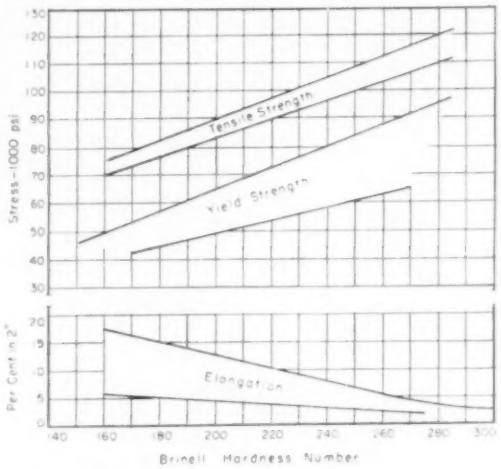

FIG. 4.—*Relationship between hardness and tensile values of pearlitic malleable iron.*

A representative core sand mixture is as follows: (1) Silica sand, 25 to 160 AFS grain fineness.* (Average fineness usually about 75.) (2) Binders: (*a*) Dry strength: core oil, resin, rosin, *et al.* (0.75 to 2 per cent. of drysand weight.) (*b*) Green-strength: cereals (0.75 to 1.50 per cent.), clays, fine bank sands. (3) Moisture: 2 to 5 per cent. (It is preferable to run as low a moisture as possible, and yet maintain adequate workability.) (4) Additives (optional, depending on the type of work being run, the method of making the cores, and the other sand-mixture constituents): (*a*) for release: kerosene, light fuel oil, proprietary compounds—usually less than 0.75 per cent., (*b*) for collapsi-

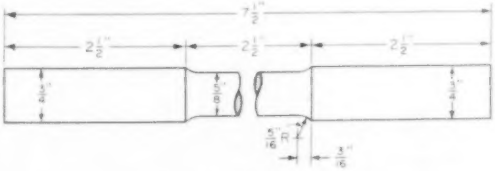

FIG. 5A.—*Design of tensile-test specimen for malleable iron.*

* Finer sands for lighter castings.

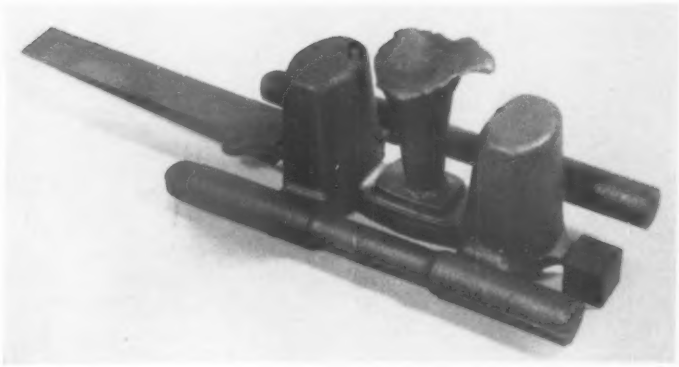

FIG. 6.—*A typical gating arrangement for casting standard tensile test bars, impact wedge, and chemical-analysis cube.*

bility: wood flour (1 per cent. or less), (*c*) for hot strength: iron oxide or silica flour, (*d*) for plasticity: more bank sand, or sodium chloride.

FIG. 7.—*Standard malleable iron test bar, Grade* 35018, *cold bent* 180 *deg. without fracture.*

Cores may be made by the shell-moulding process discussed above, or by a process which involves the rapid curing of a sodium silicate/sand mixture by carbon dioxide and/or heat.

FIG. 8.—*The standard Canadian and British bend test bar of Grade* 35018 *malleable iron has been bent* 180 *deg. without fracture.*

The gating and risering of malleable iron has received a great deal of study which has reacted favourably in establishing the reliability of malleable castings. The volume changes upon solidification approach those encountered for steel, but the lower pouring temperatures and the skilful placement of gates, risers and chills, accompanied by the malleable industry's educational programme concerning "design" for sound castings, has helped immeasurably. The white-iron castings may be cleaned by tumbling or by sand-blasting. Grinding before heat-treatment, or hard-iron grinding, as it is called, is usually restricted to small castings and to other castings which do not have large gates. Silicon-carbide wheels are generally used.

Annealing Furnace

Boyden's first annealing furnace was of beehive shape, with the pots inserted from the top. Next, to meet production schedules, he built a continuous-annealing furnace with a sloping floor, which was known as the "shoving furnace" be-

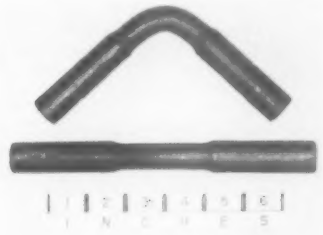

FIG. 9.—*Grade* 32510 *has good ductility as illustrated by cold bending this test bar* 90 *deg. without fracture.*

cause pots were pushed in at the higher end and out at the lower. The tunnel car-type gas-fired furnace, and the roller-tray and roller-hearth type heated by electricity or gas-fired radiant tubes—that are used to-day—are charged at one end and discharged at the other end at regular intervals and so are known as continuous furnaces.

Batch furnaces include pot, muffle, car, elevator, and bell types. They are heated by pulverized coal, oil, gas or electricity. In annealing, either the casting must be protected against an oxidizing furnace atmosphere, which causes scaling and decarburization, or the atmosphere in the furnace must be rendered non-oxidizing.

The castings may also be protected against an oxidation by an inert packing material, such as

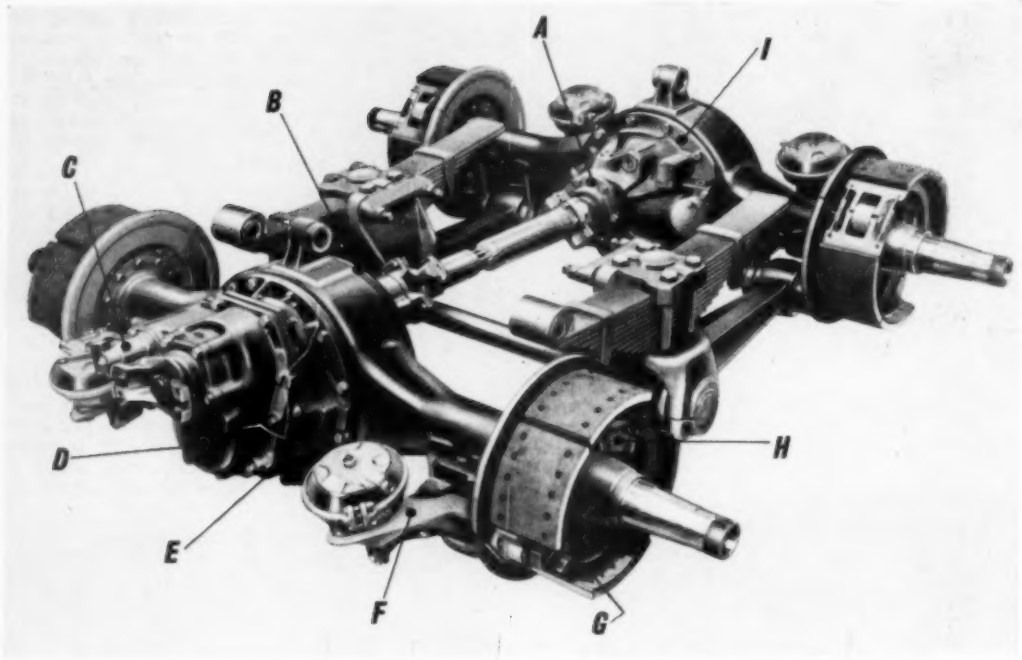

FIG. 10.—*Another heavy-duty application of malleable iron is the truck tandem-axle assembly that utilizes malleable iron for A—pinion-bearing cage, B—axle-housing cover, C—shift-lever bracket, D—differential carrier-cover, E—differential-carrier, F—camshaft bracket, G—brake shoe, H—brake spider, I—differential carrier.*

sand or gravel. Packing increases the mass to be heated, reduces the heat transfer, and therefore lengthens the annealing time.

Properties

Standard malleable castings have high toughness and ductility and excellent machinability, with good damping capacity and resistance to atmospheric corrosion. Specification A 47 (Table 4) of the American Society for Testing Materials covers two grades of standard malleable iron.

Hardness values fall in the range of 110 to 170 Bhn depending upon the base material, processing, and proposed usage. Hardness tests on castings must be selected to accommodate section, cooling rate, position of gates, etc., to arrive at arbitrary-values required. Machinability is undoubtedly the most desirable characteristic of malleable, after its basic requirements of strength and toughness have been satisfied. The graphite distribution in its ferritic matrix make it an ideal " ready to machine " material. Rapid cutting in volume production place it ahead of free-machining steels in many places. Much has been written on machinability studies of malleable and detailed comparison with cast iron and steel have recently been made in

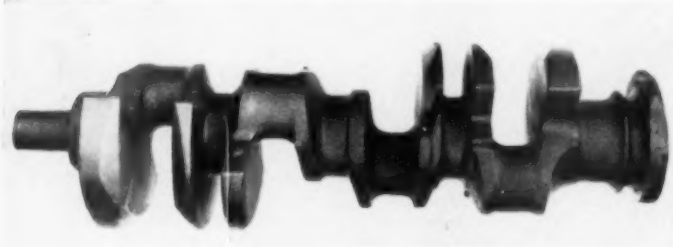

FIG. 11. — *Automobile crankshaft weighing* 85½ *lb. and* 25 $\frac{7}{16}$*-in. in length. Pearlitic malleable provides economy in manufacture, good vibration-damping characteristics, high strength and longer wear, which combine to give the automobile manufacturer an ideal material for this application.*

terms of turning, drilling, milling, threading, reaming, tapping, planing, slotting, shaping, etc., in a handbook for the malleable industry.*

Metallurgy

Basic text for the study of blackheart malleable in the US are the books by H. A. Schwartz, "American Malleable Cast Iron," 1922,† and the Malleable Founders' Society, "Malleable Iron Castings," 1960.‡ From these volumes and the hundreds of technical papers on malleable melting,

TABLE 4.—*Specifications for Standard Malleable Iron.*

Specifying group.	Number Grade.		Minimum tensile strength p.s.i.	Minimum yield point p.s.i.	Minimum elongation per cent in 2 in.	Brinell hardness number range.
American Society for Testing Materials	A 47	32510	50,000	32,500	10	110–155
	A 47	35018	53,000	35,000	18	110–155

heat-treating and testing, there emerge routines of practice finely drawn to meet the specific requirements of casting users. Malleable iron is a well-balanced composition so that under normal freezing rates it will solidify wholly as "white" iron.

* Malleable Iron Castings—Malleable Founders' Society, Cleveland, Ohio, US.

† Penton Publishing Company, Cleveland, Ohio, US.

‡ Malleable Founders' Society, Cleveland, Ohio, US.

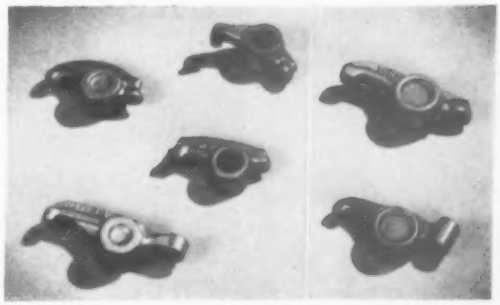

FIG. 12.—*Castability, strength, and ease of selective hardening have made pearlitic malleable iron the choice for rocker arms in internal combustion engines.*

The carbon-silicon chemistry of malleable iron is carefully maintained in balance. (Refer Fig. 2.)

TABLE 5.—*Composition.*
Grade 32510 and 35018 standard malleable iron are produced from white-iron castings whose chemical composition generally falls within the following limits:

	Grade 32510	Grade 35018
	Per cent.	Per cent.
Carbon	2.30 to 2.65	2.00 to 2.45
Silicon	1.40 to 0.90	1.25 to 0.95
Manganese	0.25 to 0.55	0.25 to 0.55
Phosphorus	Less than 0.18	Less than 0.18
Sulphur	0.05 to 0.18	0.05 to 0.18

FIG. 13.—*A typical group of agricultural implement castings.*

Silicon

The strong tendency of silicon to promote primary graphitization makes it obvious that excessive silicon contents must be avoided when the carbon level is high, or the cooling rate is low, or both. However, if the silicon content is too low though the iron may freeze entirely as white iron, the dissociation of cementite during the subsequent heat-treatment will be very sluggish and will require prolonged heating to break down the massive carbides. At 1.4 per cent. silicon, an iron will malleablize in half the time of one with only 1.0 per cent. silicon. The delicate equilibrium between elements may be disturbed by those that favour graphite formation and those that retard or prevent the breakdown of cementite. The former are referred to as

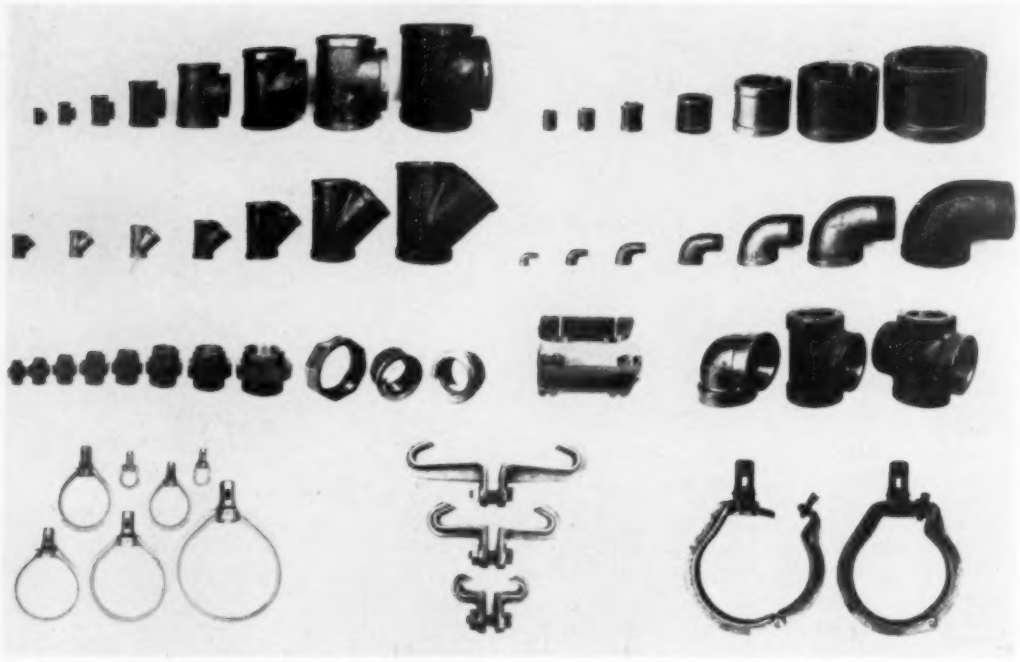

FIG. 14.—*Malleable iron is a natural choice for plumbing parts such as these pipe fittings and pipe hangers. Soundness, castability and ductility are the properties responsible for this use. Ease of machining contributes production economies.*

"graphitizers," the latter as "carbide stabilizers" or "retardants." Their behaviour is classified as follow:—Graphitizers—Al, B, Be, Ni, Cu, Si, C, Ca, Ti, Zr, Co, CO_2; Carbide Stabilizers—Bi, Ce, Cr, Mg, Pb, Mo, S, Se, Te; Furnace gases—H, N.

Manganese and Sulphur

Theoretically, 1.7 parts of sulphur are needed to combine with one part manganese to form MnS. A manganese content of three times the sulphur or two times the sulphur plus 0.15 per cent. is common. Since both manganese and sulphur are carbide stabilizers, if either is allowed to rise much above that needed to form the sulphide, it will exert a stabilizing effect on the iron carbides. When white iron is re-heated for first-stage graphitization, the initial rejection of a minute carbon spot depletes the austenite of carbon, and so more is dissolved from the adjacent cementite, leading to further carbon deposition on the original graphite nucleus. Holding white iron castings at first stage malleablizing temperature enables these reactions to continue until all massive carbides have been decomposed.

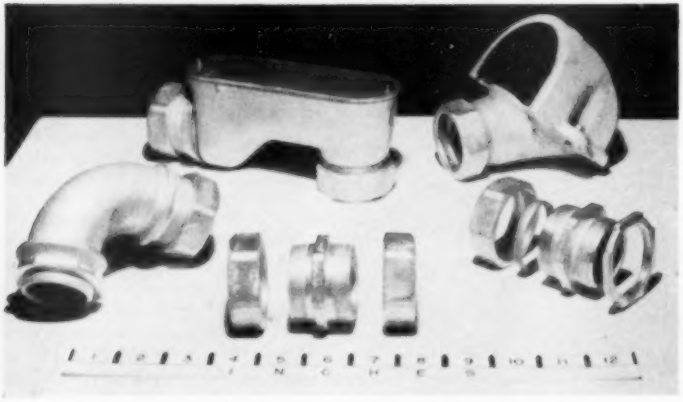

FIG. 15.—*Electric-distribution systems utilize standard malleable for conduit fittings such as these bodies, nuts and rings.*

FIG. 16.—*The chain-hoist assembly uses many malleable iron parts. Initial economy and dependable service are prime factors in the choice of this material.*

Furnace Atmosphere

The temperatures employed for malleablization are sufficiently high to induce extensive scaling and decarburization if the castings are left exposed to normal room atmospheres during the treatment. Therefore preventive steps are taken in commercial practice by sealing the hot castings from the air or by surrounding them with a controlled artificial atmosphere that will minimize or eliminate scaling and decarburization.

Annealing

For rapid annealing it is desirable to have a relatively large number of graphite nodules per unit volume. A number of means are available for increasing the nodule count: (1) Obtain a fine dispersion of the massive carbides. (2) Prebake for a few hours between 345 and 425 deg. C. (3) Use an initially high first-stage temperature. (4) Alloy with graphitizers, such as silicon, aluminium, or boron. (5) Prestress the white iron before malleablizing. (6) Control the melting furnace atmosphere so that it is highly reducing. (7) Pretreat the iron so as to have a martensitic matrix.

After completion of first-stage malleablization the temperature is slowly lowered and more carbon precipitates.

This is second-stage malleablization. During a slow rate of cooling through the critical eutectoid range graphitization proceeds at a rate about 10 times that which held when the iron was at a temperature immediately above the range.

Embrittlement

Once an iron has been fully graphitized on slow passage through the critical-temperature zone, no further structural changes take place at lower temperatures. A fairly rapid cool from 630 deg. C. or higher is desirable in order to offset any embrittling tendency. Rapid cooling of the iron with high phosphorus and silicon contents from within the " blue heat " range of 595 to 230 deg. C. will raise the nil-ductility-transition temperature sufficiently for the metal to become brittle at or above room temperatures. The worst embrittlement results when susceptible irons are quenched from about 455 deg. C. This is approximately the same temperature as a hot-dip galvanizing bath; galvanizing such castings may render them brittle. Several means are applicable for avoiding or reducing the danger of galvanizing-embrittlement: (*a*) Keep the combination of silicon and phosphorus contents below the critical levels. (*b*) Cool rapidly from no lower than 630 deg. C. (*c*) Alloy the iron, *e.g.*, with copper or with molybdenum. (*d*) Cool slowly from the embrittling temperature. (*e*) Hold the iron at some temperature under the embrittling temperature range.

Alloying

Copper may be added primarily to improve

FIG. 17.—*Subject to constant abuse, industrial casters, components of which are shown here, are a natural application for the many benefits available in malleable castings.*

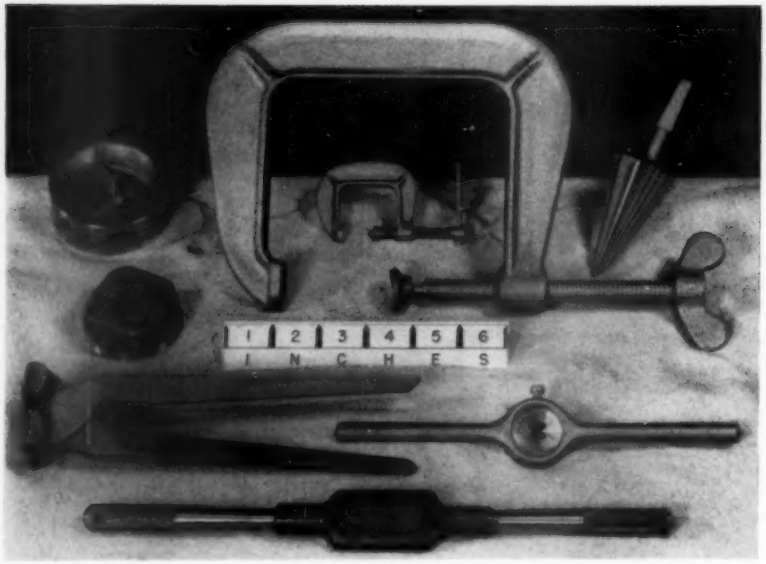

FIG. 18.—*Other examples of the use of malleable iron for hand tools are these tool holders, reamers, and clamps. Again, fine finish and dependability make malleable iron first choice in this field.*

the corrosion resistance of malleable iron, to increase its strength, or both. Besides these attributes, however, copper will raise the hardness of the iron, shorten the duration of the malleablizing anneal, reduce the susceptibility to temper embrittlement, enhance fatigue or endurance strength, and render the metal amenable to precipitation heat-treatments. Molybdenum additions up to 0.5 per cent. increase the tensile strength of malleable irons by as much as 7,000 lb. per sq. in. and the yield strength as much as 3,000 lb. per sq. in.

It is more common practice in the manufacture of molybdenum-bearing alloyed malleable iron to add also enough copper to offset the carbide-stabilizing effect of the molybdenum. It is customary to add 0.5 to 1.25 per cent. copper to balance some 0.2 to 0.4 per cent. molybdenum. This not only promotes graphitization but also contributes to the strength, hardness, and corrosion resistance of the castings. In some instances nickel, rather than molbdenum, is used in conjunction with copper, this alloy combination malleablizing readily.

Other alloys are used to secure special results. Among these are bismuth, boron, chromium, manganese, nickel, sulphur, and tellurium.

Pearlitic Malleable

The first step in the manufacture of pearlitic malleable iron starts with the production of white-iron castings in which the carbon is in the combined form. These are basically of the same chemical composition as the white-iron castings that are converted into standard malleable. The second step in the pearlitic-malleable process—that of heat-treatment—starts out the same as in the production of ferritic- or standard malleable castings.

In all grades of pearlitic malleable iron, first-stage graphitization is carried to completion. Thereafter the processing departs from the usual malleablizing treatment. First-stage graphitization is essentially the same as the first-stage of a full malleablizing treatment.

Second stage cycle. In some plants all castings are initially given the same full malleablizing anneal, resulting in a wholly ferritic material. Then only those castings that are to be pearlitic are reheat-treated. Copper- or manganese-alloyed pearlitic malleable may be processed with standard malleable production in a normal

TABLE 6.—*Extracts from US Specifications for Malleable Physical Properties.*

Type and grade.	Standard.		Pearlitic.
	32510	35018	
Composition, per cent.	C 2.3–2.7, Si 1.5–0.8, Mn 0.55 max., P 0.18 max., S 0.20 max	C 2.0–2.45, Si 1.4–0.85, Mn 0.55 max., P 0.18 max., S 0.20 max.	Same as standard grades except that manganese can be higher.
Physical properties:			
Density, lb/cu. in.	0.258–0.263	0.259–0.263	0.259–0.263
Thermal conductivity, Btu./hr./sq. ft./°F./ft.—			
80 F.	29.5	29.5	0.259–0.263
700 F.	23.0	23.0	0.259–0.263
Coef. of Ther. Exp. (68–750 F.), per °F.	5.6×10^{-6}	6.6×10^{-6}	0.259–0.263
Specific heat (50–750 F), Btu./lb./°F.	0.133	0.133	—
Electrical resistivity (68 F.), microhm-cm.	32.0	32.0	39.19–41.37
Magnetic?	Yes	Yes	Yes
Mechanical properties:			
Mod. of elast. in tension, p.s.i.	24×10^6	25×10^6	28×10^6
Tensile strength, 1,000 p.s.i.	50–52	53–60	60–90
Yield strength, 1,000 p.s.i.	32–35	35–40	40–70
Elongation (in 2 in.), per cent.	10–18	18–25	12–3
Reduction of area, per cent.	18–23	18–23	—
Hardness (Brinell)	110–145	110–145	160–235
Impact strength (Charpy, ft.-lb.	16.5	16.5	12

annealing cycle. The alloying sufficiently retards second-stage graphitization so that laminar or partially-spheroidized pearlite, remains in the matrix of the finished product.

The following eight processes of pearlitic malleable production are now in use:—(1) Air-quench and temper, (2) air-quench, reheat, liquid-quench and temper, (3) liquid-quench and temper, (4) malleablize, reheat, and air-quench, (5) malleablize, reheat, liquid-quench, and temper, (6) alloy, air-quench, and temper, (7) alloy, air-quench, reheat, liquid-quench, temper, (8) alloy, malleable cycle. (Fig. 3.)

Pearlitic malleable irons are available with strengths of 65,000 to 120,000 p.s.i. or higher, yield strengths of 45,000 to 100,000 p.s.i. or higher, with elongations of 1.6 to 2 per cent. in 2 in. (Fig. 4.)

Properties

The combination of strength, ductility, ready machinability and shock resistance, and many other established engineering characteristics, make standard malleable eligible for numerous applications for tough castings while the high strength available in pearlitic malleable supplies the need for extra strength.

The principal American specifications to which they are made are given in ASTM specifications 32510, 35018 (and pearlitic), see Table 6.

Tests of separately-cast specimen bars hence furnish a close appraisal of the properties of malleable castings made from the same metal as the bars. Figs. 5, 6, 7, 8 and 9 illustrate the test specimens commonly used.

Use in Industry

Informal surveys indicate that the uses of malleable castings are distributed approximately as follow: Automobiles 30, trucks and trailers 18, valves and fittings 10, agricultural equipment 10, general industrial machinery 5, construction and mining machinery 5, electrical equipment 4, miscellaneous 15 per cent. Major consumer, taking half the output is the automobile industry. Figs. 10, 11 and 12 show typical examples. Other are pedals, pedal brackets (Fig. 13), and rear-axle housings. Other applications in the transportation field are: railroad brake-heads, hand-brake wheels, door fixtures, tank-car dome covers, valves, draft-gear parts, journal boxes. Marine equipment, deck fittings, oar locks, anchors, cargo-handling parts, capstans. A substantial tonnage of castings is made for agricultural equipment for such parts as earth movers, guards and shoes, brackets, detachable chain. Pipe-fitting valves, flanges, fittings for railroad, marine and other heavy-duty service, pipe wrenches and other plumbing tools as shown in Fig. 14 as well as electrical-equipment castings such as insulator brackets and caps, pole-brackets, cable hangers, junction boxes, outlets, motor and generator parts. Fig. 15 illustrates some. Hardware and hundreds of tools and chains for the construction, packaging, and conveying equipment, occupy a considerable portion of production capacity. Figs. 16, 17, 18 illustrate these applications. The overall picture in the field of malleable castings is of a broad range of established uses for malleable combined with the awareness of the need to remain competitive and to progress with the technical advances that are made in the industry. It is this that enables one to forecast a steady market for the 150 malleable foundries and their million ton annual output.

We are indebted to the Malleable Founders' Society of the US for their help with much of the text and for the illustrations used, through the courtesy of Hans Heine, Technical Director.

Training of Supervisors

A committee appointed by the Minister of Labour, Mr. John Hare, to make an inquiry into the selection and training of supervisors, held its first meeting on Tuesday, April 18. The terms of reference of the committee are—"To review the progress made since the publication in 1954 of the Report of the Committee of Inquiry on the Training of Supervisors and the problems which have been encountered in organizing effective training schemes, to consider arrangements for the selection of supervisors and to examine whether there is a need for a central organization to further the development of supervisory training." The committee is representative of the voluntary organizations concerned with the provision of supervisory training, the British Employers' Confederation, the Federation of British Industries, the Trades Union Congress, the nationalized industries, the Ministry of Labour and the Ministry of Education.

The chairman of the new committee is Mr. D. C. Barnes, under secretary, industrial relations department of the Ministry of Labour, and amongst the 16-man committee are: Mr. D. B. Beynon, labour manager, F. H. Lloyd & Company, Limited, representing British Institute of Management; Mr. P. J. Casey, assistant secretary, British Employers' Confederation; Mr. A. R. Duncan, deputy head of the training department, British Iron and Steel Federation (also representing British Employers' Confederation), and Mr. J. J. Henderson, general secretary, Institute of Industrial Supervisors. The secretary is Mr. J. H. Galbraith (Ministry of Labour).

General Electric Company, Limited, has announced that Sir Toby Low, Conservative M.P. for Blackpool North, has been elected vice-chairman of the company.

In addition to participating in the British Trade Fair, Moscow, George Kent, Limited, of Luton, are also showing a selection of their products at the thirteenth Exhibition and Congress of Chemical Engineering (stand G10) forming part of the 1961 ACHEMA Congress at Frankfurt on Main, June 9 to 17.

Ruston & Hornsby, Limited, engineers, Lincoln, and their associate, Davey Paxman & Company, Limited, Colchester, are exhibiting at the Moscow Trade Fair from May 19 to June 4. The Lincoln works of Ruston & Hornsby were visited by a trade delegation from Russia in 1956, and in 1959 the firm was host to a Russian scientific and technical delegation. In the same year a Ruston-built mobile power-station was shipped from the works to the Soviet Union.

International Foundry Congress

Detailed Arrangements in Vienna, for the Week June 18 to 24.

The twenty-eighth International Foundry Congress, organized by the *Verein Osterreichischer Giessereifachleute* (Austrian Foundrymen's Technical Association) on behalf of the International Committee of Foundry Technical Associations is being held this year in Vienna (Austria) and the detailed programme is now available.

The Congress will take place from June 18 to 24, and all meetings, technical sessions, social events, etc., will be held in the state rooms of the Hofburg Palace, the former residence of the Austrian Emperors (Fig. 1). In addition to the events of the Congress itself, there will also be the attractions of the Viennese Festival, which takes place at the same time, and whilst this will mean that Vienna will be at its gayest and best, it will also mean that delegates may have some difficulty in booking accommodation. They are therefore advised to book as early as possible, all hotel rooms for Congress participants being reserved exclusively from Internationalen Reise-und Touristenburo, COSMOS, Wien, 1, Kärntner Ring 15, Austria.* Delegates using their own cars will find parking space available at the Congress building (Heldenplatz). Coaches taking members on excursions, works visits, etc., will be stationed near the Congress Building.

The official languages of the Congress are English, French and German, and at the technical sessions simultaneous translations will be given of the papers and discussions. Registered delegates from Europe can expect to receive preprints of the papers one month before the Congress opens. Details of the programme are as follow: —

Programme

Sunday, June 18

11 *a.m. to* 6 *p.m.*—Registration of delegates at the Congress Office (Congress Building, Weiner Hofburg).

2.30 *p.m.*—Meeting of past-presidents of the International Committee of Foundry Technical Associations.

Monday, June 19

10 *to* 12 *a.m.*—Office opening ceremony. 1 to 2.50 p.m.—Two simultaneous technical sessions. During the afternoon there will also be meetings of the International Committee groups on cast iron and foundry coke.

3 *p.m.*—Departure from the Hofburg by coach for a sightseeing tour and a visit to Schonbrunn Castle, followed at 7 p.m. by a visit to a Viennese "Heuriger" (members and ladies).

Tuesday, June 20

8.30 *a.m. to* 6 *p.m.*—Technical sessions; meetings of various International Committee groups. 8.30 to 7 p.m. (For the ladies a special programme has been arranged, consisting of a visit to the School of Fashions of the Town of Vienna at Hetzendorf Castle, leaving the Hofburg at 2.30 p.m.) For the evening, a number of seats for the Viennese State Opera have been reserved.

* United Kingdom foundrymen intending to participate in the Congress are advised to make all bookings through the secretary (Mr. G. Lambert) of the Institute of British Foundrymen, 14, Pall Mall, London, S.W.1, from whom all documents may be obtained.

FIG. 1.—*View of the Hofburg Palace in which the International Foundry Congress is to be held.*

Wednesday, June 21

8.30 *a.m. to* 12.30 *p.m.*—Technical sessions. 2 to 6 p.m.—Works visits. Alternatively, members and ladies have the choice of visiting, in the morning, the Museum of Fine Arts. In the afternoon for ladies only there is a visit to the Porcelain works of "Augarten" and a concert by a Viennese Boy's Choir, followed by Viennese Jause. In the evening at 8 p.m. the banquet for official delegates will be held in the Palais Auersperg.

Thursday, June 22

The whole day will be devoted to works visits. In all, 27 visits have been arranged as shown in Table 1. For the ladies a whole-day excursion to the Bergenland, including a visit to the ancient Roman ruins and the Musem Carnuntinum, also to the Hayan Church and the Palace of Prince Esterhazy, has been arranged.

Friday, June 23

2 *to* 6 *p.m.*—Meeting of the International Committee of Foundry Technical Associations. Also, in the morning, a special presentation in the Spanish Riding School has been arranged for delegates and their ladies. For the ladies, a second opportunity is given to visit (in the afternoon) the Porcelain Manufacturing works and attending the Viennese choirboy's concert. A ball, to be held in the evening in the state rooms of the Hofburg, will be opened by the Ballet of the Viennese State Opera.

Saturday, June 24.—Official closing ceremony from 10.30 to 12 a.m.

Post-congress Tours*

After the Congress, there will be two excursions each lasting one week, beginning and ending in Vienna. The tours will cover the Austrian regions of industry in the south and west, and will in fact both cover the same ground, one in a clockwise and the other in anti-clockwise direction of travel, all other arrangements being the same in each case.

General

Registration Fees.—A standard Congress registration fee of 1,200 Austrian schillings (about £16 10s.) is payable by all male delegates attending the Congress. It covers admission to technical sessions, opening and closing ceremonies, the Monday's "Heuriger" and Friday's social evening and ball for both the delegate and his wife (and also for the lady's excursion to Bergenland on the Thursday). Each of the work's visits excursions is priced separately as are additional trips arranged for the ladies, opera-house seats, etc. For the post-Congress tours, two "all-in" charges have been arranged (of 2,500 and 1,800 Austrian schillings respectively) according to class of accommodation desired.

Closing Date.—A closing date for applications to attend the Congress is quoted in the documents as April 15 but as no detailed information or application forms were received in the United Kingdom until the week commencing April 10, it would have been difficult to adhere to this date. However, it is incumbent on all from this country who wish to attend to register their plans immediately if they have not already done so. The address of the organizers (for those who may wish to register direct) is that of the secretary, *Verein Osterreichischer Giessereifachleute*, 1 Ferstelgasse, Vienna 9, Austria.

* Austrian works to be visited during the Post-Congress tours will be published later.

TABLE 1.—*Series of Works Visits arranged for Congress Week.*

No.	Type.*	Works to be visited.	Location.
1	A	Austria, Vereinigte Emaillierwerke Aktiengesellschaft	Vienna
2	D	Gebauer & Lehrner	Vienna
3	A C D	Gebr. Grundmann OHG	Herzogenburg
4	B C	Osterreichisch-Alpine Montangesellschaft, Werk	Traisen
5	—	Osterreichische Brown Boveri-Werke	Vienna
6	D	Aktiegesellschaft Josef Pfundner	Vienna
7	—	C. Reichert, Optische Werke Aktiengesellschaft	Vienna
8	A C	M. Schmid & Söhne	Wilhelmsburg
9	—	Siemens & Halske Gesellschaft m.b.H.	Vienna
10	—	Siemens-Schuckertwerke Gesellschaft m.b.H.	Vienna
11	—	Simmering-Graz-Pauker Aktiengesellschaft	Vienna
12	D	Vereinigte Wiener Metallwerke Aktiengesellschaft	Vienna
13	A	J. M. Voith Aktiengesellschaft	St. Polten
14	A B	Waagner-Biro Aktiengesellschaft	Vienna
15	D	Franz Zimmermann & Söhne	Vienna
16	A	Austria, Vereinigte Emaillierwerke Aktiengesellschaft	Vienna
		Siemens-Schuckertwerke Gesellschaft m.b.H.	Vienna
17	D	Gebauer & Lehrner	Vienna
	A	Austria, Vereinigte Emaillierwerke Aktiengesellschaft	Vienna
18	A C D	Gebr. Grundmann OHG	Herzogenburg
		Giessereisand K. G. Ing. Fischer	Statzendorf
19	A	Maschinenfabrik HEID Aktiengesellschaft	Stockerau
		C. Reichert, Optische Werke Aktiengesellschaft	Vienna
20	B C	Osterreichisch-Alpine Montangesellschaft, Werk	Traisen
	A	J. M. Voith Aktiengesellschaft	St. Polten
21	—	Osterreichische Studiengesellschaft fur Atomenergie Ges. m.b.H.	Seibersdorf
		Osterreichische Brown Boveri-Werke Aktiengesellschaft	Vienna
22	A C	M. Schmid & Söhne	Wilhelmsburg
	B	Stahlwerk Ybbs Ges. m.b.H.	Ybbs a.d.D.
23	A B	Schoeller-Blackmann Stahlwerke Aktiengesellschaft	Ternitz
		Osterreichische Brown Boveri-Werke Aktiengesellschaft	Vienna
24	A	Steyr-Daimler-Puch Aktiengesellschaft	Steyr
25	D	Vereinigte Wiener Metallwerke Aktiengesellschaft	Vienna
	D	Josef Pfundner	Vienna
26	A B	Waagner-Biro Aktiengesellschaft	Vienna
		Simmering-Graz-Pauker Aktiengesellschaft	Vienna
27	D	Franz Zimmermann & Sohne	Vienna
		Siemens & Halske Gesellschaft m.b.H.	Vienna

* A denotes works with a grey-iron foundry; B, works with a steel-foundry; C, those with a malleable-iron foundry and D, works with a light-alloy and/or a copper-base foundry.

Technical Papers

The following papers will be read at the Congress under the general heading: "Research and Production," in two lecture rooms equipped for simultaneous translation into the three official languages. The technical sessions will take place on Monday, June 19, from 1 p.m. to 2.50 p.m., on Tuesday, June 20, from 8.30 a.m. to 12.30 p.m. and 2 p.m. to 6 p.m., and on Wednesday, June 21, morning

International Foundry Congress

sessions only, 8.30 a.m. to 12.30 p.m. So far, the programme does not disclose allocation of papers listed below, to the respective sessions:

(*1*) Reduction of Blowholes in Castings, by J. Ornst (Czechoslovakia); (*2*) Embrittling Effect of Phosphorus in Cast Steel and Possibilities of its Elimination, by Prof. Dr. J. Czikel (Germany); (*3*) Heat Economy of the Cold-blast Cupola, by H. Pacina and Dr. H. Siepmann (Germany); (*4*) Between Obsolete Empiricism and Delusive Scientific Strictness—Application of Statistical Methods in the Foundry, by G. Blanc and J. Cl. Margerie (France); (*5*) Study of Nuclei by the Granule Method and its Application to Aluminium, by C. Mascré, Miss A. Touguet and M. Drouzy (France); (*6*) Ultrasonic Detection of Defects in Cast Steel, by Dr. A. H. Sully and J. D. Lavender (Great Britain); (*7*) Solidification of Eutectics, by Dr. I. Minkoff (Israel); (*8*) Technical and Administrative Organization in a Foundry producing Large-size Castings, by A. Rege and O. Ciangaretti (Italy); (*9*) Controlled Directional Solidification in 100-ton Steel Castings, by P. Tavolotti and G. Jaccarino (Italy); (*10*) Rôle of Calcium in the production of Spheroidal-graphite Cast Iron, by Prof. T. Kusakawa (Japan); (*11*) A Scavenging Method for the prevention of Porosity in Castings, by Dr. K. Suzuki and H. Yamaoka (Japan); (*12*) Influence of Some Elements on the Formation of Graphite and on the Eutectic Cell, by C. Pelhan (Jugoslavia); (*13*) Vacuum Melting of Cast Iron and its Influence on the Inoculation Effect, by Prof. Dr. A. Zuithoff and Dr. R. A. Kortmulder (Holland); (*14*) Practical Experience in the Low-pressure Casting of Aluminium, by J. Berger (Austria); (*15*) Investigation and attempted Interpretation of Factors influencing the Useful Life of Slab Moulds, by A. Czech (Austria); (*16*) A Blast- and Exhaust-gas-controlled Cold-blast Cupola for achieving Constant Carbon and Silicon Contents within the Limits of ±0.1 per cent., by F. Lutz (Austria); (*17*) High-temperature Microscopy of Cast Materials, by Prof. Dr. R. Mitsche (Austria); (*18*) The L-D Process in the Steel Foundry, by Dr. Rinesch, H. Neudecker and J. Eibl (Austria); (*19*) Investigation of Maximum Permissible Pouring Times for Steel Castings in Green-sand Moulds, by K. Hess (Poland); (*20*) New Characteristics for evaluating the Quality of Cast Iron, by Dr. A. Karamara (Poland); (*21*) Influence of Production Method and Alloy Composition on the Mechanical and Elastic Properties of Piston Rings, by Prof. Dr. E. Englisch (Sweden); (*22*) Application of Scavenging Gas and Gas Injection in the Foundry, by Dr. E. Modl (Switzerland); (*23*) Flowability of Moulding Sands, by Dr. M. Navarro and Dr. J. Navarro-Alcacer (Spain); (*24*) Problems of Theory and Practice in the Application of Sodium-silicate-bonded Moulding Sands in Foundries of the USSR, by A. M. Liass (Russia); (*25*) Shell Moulds, by B. P. Platonov,

(*Continued at foot of col.* 2)

B. V. Rabinovich and F. F. Rezinskich (Russia); (*26*) The Cross-channel in Gating Systems for Iron Castings and its influence upon Uniform Filling of the Mould, by S. Kalman (Hungary); (*27*) Influence of Slag on the Properties of Cast Iron, by F. Varga (Hungary), and (*28*) Desulphurization of Carbon Steel to Extra-low Limits in the Basic Electric Furnace, by A. J. Kiesler (USA).

Industrial Finishes Exhibition

Over the last decade, the advances that have been made in industrial finishing techniques and processes are probably as great, or greater, than those in any other field, and for the first time many of these will be brought together under one roof when the Industrial Finishes Exhibition opens at Earls Court, London, on May 8. Exhibits will include finishing equipment, materials, plant and processes incorporating metal pre-treatments, paints and their applications, electroplating, metal-colouring, anodizing, vitreous enamelling, shotblasting, vacuum deposition and instrumentation. (The exhibition closes on May 11.)

At the convention to be held concurrently with the exhibition, the programme of 16 technical papers includes one by Dr. B. K. Niklewski of the Vitreous Enamel Development Council on "Choosing Vitreous Enamel as an Industrial Finish." Other papers of some interest to foundrymen are: "Surface Coating Methods and Equipment," by J. Muirhead, of the Spray Equipment Manufacturers' Association; "Recent Advances in Finishing Aluminium," by F. C. Porter (Aluminium Development Association); "Painting of Sprayed Metal Coatings," by Dr. L. Valentine (Paint Research Station); "Metal Spraying for Finishing Preparatory Treatments," by J. S. Stanners (British Iron and Steel Research Association), and "Cleaning of Metals Prior to Processing," by H. F. Winfield (Magnus Chemical Company, Limited).

Metal and Plastic Coatings

In conjunction with the above exhibition and convention the Metal and Plastic Coatings Association is holding a symposium on May 9 in the conference room at Earls Court, when the following papers will be read under the presidency of Mr. H. W. Fender, chairman of the Association:—"Characteristics of Raw Materials in Plastic Coatings," by Mr. J. A. Rhys (F. W. Berk & Company, Limited, National College of Rubber Technology); "Metal Spraying for Finishing Preparatory Treatments," by Mr. J. F. Stanners (British Iron and Steel Research Association), and "Painting Sprayed Metal Coatings," by Dr. L. Valentine (Paint Research Station).

The Industrial Finishes Exhibition and Convention is being organized by Scientific Surveys, Limited, and further information about the metal and plastic coatings symposium may be obtained from the secretary of the Association, 189, Brent Crescent, North Circular Road, London, N.W.10.

Electric Steel Makers' Guild

The Electric Steel Makers' Guild (c/o Steel, Peech & Tozer, P.O. Box 50, Rotherham) announce that new officers to take office on May 1, for 1961/62, are as follow: As president, Mr. W. Keen; as vice-president, Mr. R. S. Howes and as secretary, Mr. F. Crankshaw. The Guild exists to promote progress in the manufacture of steel for commercial purposes in electric furnaces and to encourage free discussion and exchange of information of mutual interest and benefit to members.

Epstein's "Pan Group"

Sir Jacob Epstein's final work (completed the day before his death) of five figures—known as the "Pan Group"—has now been erected in Hyde Park near the Edinburgh Gate. Commissioned by the Land Securities Investment Trust, Limited, and cast in the foundry of the Morris Singer Company in South Lambeth, London, the bronze figures were moulded and cast in the exceptionally rapid time of twelve months. The work consists of a 7-ft. high dog, an 8-ft. boy, a 12-ft. man, a 16-ft. 6-in. woman and a 13-ft. "Pan" shown grouped in the accompanying illustration. They were cast by the cire-perdu (lost-wax) and the sand processes.

Armatures were cast into the legs of each of the figures and these terminated in spigots that were fitted into prepared sockets on a fabricated baseplate. The woman, 16½-ft. long at an angle of 45 deg., is supported only on a piece of her bronze drapery, 18 by 6 in., resting on the base. This too, hides a steel armature to enable the pose to be maintained.

The differences in the shrinkages between the wax and the sand process were carefully calculated and the result was a perfect fit and a perfect job from the foundry point of view.

"Escape from London into the open spaces of the park" is the theme of Sir Jacob Epstein's last work, the gift of the Epstein statue group—recently presented to the nation by the property magnate, Mr. Herbert Samuels. It was placed in position at the Edinburgh Gate at the Bowater entrance to Hyde Park.

Industrial Relations Handbook

A revised edition of the Ministry of Labour's "Industrial Relations Handbook" has now been published and is obtainable from H.M. Stationery Office, price 5s. 6d. net. The Handbook does not advocate particular practices or procedures, but sets out essential facts about the organization of employers and employees in Great Britain, explains how they negotiate, and about what, how differences are settled, what part is played by the Government, and how relationships at the place of work may be adjusted.

Changes in this latest edition take account of recent legislation—for example, the revocation of the Industrial Disputes Orders and the passing of the Terms and Conditions of Employment Act, 1959. As well as dealing with the development of joint negotiation between employers and employees and the role of the Minister in industrial relations, information is also given about wages, hours of work and holidays. In the latter section, there are references to payment by results, other systems of incentive payments, work-study and methods of calculating overtime rates.

There's a Bomb in my Bucket!

While working on the site of a new steel furnace at Rotherham—part of the United Steel Company's £10,000,000 modernization plan, an excavator driver was amazed to see a bomb in his bucket, which was suspended 20 ft. in the air on the end of the boom. He leaned out of his cabin and shouted: "There's a bomb in my bucket." Although he had handled bombs while in the Forces he was not sure what to do about this one. He decided however it was no use getting scared over it, and so gingerly he lowered the boom and emptied the earth and the bomb carefully on the ground. As soon as the bomb was lowered safely to the ground, the police were summoned. Sandbags were placed round it and the corner of the site where the bomb was found was cordoned off to await an Army disposal squad.

The missile was later proved to be a 200-lb. unexploded bomb of the First World War dropped from a zeppelin in an air-raid on Sheffield on September 25, 1916. The bomb has now been exploded by officers of the Royal Engineers.

Personal

Mr. HAROLD T. JENKINS has been appointed technical director, and Mr. J. S. WARING production director of Robert Jenkins & Company, Limited, engineers, Rotherham.

Mr. HARRY PARKINSON has become chairman and sole managing director of J. Parkinson & Son (Shipley), Limited, a subsidiary of Crofts Engineers (Holdings), Limited. Mr. EDWARD PARKINSON, chairman and joint managing director of J. Parkinson & Son, has retired from the board and Mr. T. STARON has been appointed a director of that board.

Wolverhampton Labour Councillor Mr. DENNIS BIRCH has been appointed Press relations officer with the John Thompson group. Mr. Birch, who is 36, has been with the group for 20 years, commencing as an engineering apprentice. He has represented Heath Town on Wolverhampton Council since 1952 and is chairman of the finance committee.

Mr. G. D. WILKES who has been with Gabriel & Company, Limited, A. B. Row, Birmingham, stainless-steel founders, for the past 15 years and is at present secretary of the company has been appointed a special director of the firm. Works manager Mr. G. A. SPENCER who has worked for the firm for 25 years has also been appointed a special director.

Dr. T. U. MATTHEW has been appointed as director manufacturing, Massey-Ferguson (United Kingdom), Limited. Since 1955 he has been a director of a number of the engineering and manufacturing companies in the Tube Investments group and has also been responsible, as engineering director of T.I. (group services), for consulting and engineering services to T.I. group companies.

Mr. H. E. Cox has been appointed director of manufacture, Associated Electrical Industries (Rugby), Limited, following the recent retirement of Mr. H. L. SATCHELL. Mr. Cox was appointed manager of the Rugby works in 1955 and general manager in 1957. He joined the board of British Thomson Houston Company, Limited (now AEI (Rugby)), in 1958, and was appointed deputy director of manufacture in January, 1960.

Mr. GEOFFREY KING, O.B.E., production control director of Raleigh Industries, Limited, has been appointed director in charge of the home sales cycle division with a seat on the company's board of directors. He continues his responsibility as director of the sub-contract sales of the group. He joined the company in 1941 and in 1951 became a director of Rudge-Whitworth, Limited, and four years later was appointed to the board of the Raleigh Cycle Company, Limited.

Mr. W. J. RICHARDS, 57, director of the Royal Radar Establishment, Malvern, has been appointed the first director of the proposed new Staff College for Further Education. He will take up his new appointment in July. The aim of the College is to create a national centre at which principals and other selected staff from colleges of technology and commerce can exchange ideas and experience with senior staff from industry, local and central government, the universities, and overseas.

Mr. D. B. KIMBER, shipbuilding manager of the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, since 1959, has been appointed a director of the company. He joined Fairfields in 1954 as shipyard manager. Mr. JAMES LENAGHAN, managing director of that company, has been appointed a director of David Rowan & Company, Limited, marine engineers, Glasgow. Fairfields and Rowans are both members of the Lithgow group of companies. Mr. GEORGE H. PARKER has been appointed assistant general manager of Lithgows, Limited, Port Glasgow. He joined the firm in 1955 as an assistant manager.

Mr. H. A. DENNE, director of sales, has retired from the board and his executive responsibilities for Ford Motor Company, Limited. He has served the company for 34 years, and has been a director since 1956. Following his retirement he has agreed to advise the American Ford Company on a part-time consultancy basis, in connection with certain of its overseas developments. Mr. S. J. ELLIOTT, director of finance of Ford Motor Company has relinquished his executive responsibilities having reached retirement age. He will remain a member of the board. Mr. Elliott was appointed a director in 1959 and has served the company for 30 years.

Brigadier A. LEVESLEY, a director of Edgar Allen & Company, Limited, Sheffield, and Mr. T. H. BURLEIGH, managing director of Firth Brown Tools, Limited, were nominated as senior and junior vice-presidents respectively of Sheffield Chamber of Commerce on April 17. The nomination for the senior vice-presidency was necessary because Mr. J. T. W. DEWAR, managing director of Firth-Vickers Stainless Steels, Limited, the present junior vice-president, is not proceeding to the senior post through pressure of business. Mr. DENIS SENIOR, managing director of George Senior & Sons, Limited, is the present senior vice-president and is due to become president in May.

Mr. ARTHUR HOSKER, production manager for many years, has been appointed works manager of the headquarters factories of Leyland Motors, Limited, Lancs. Mr. Hosker joined the company in 1920 as an apprentice and was transferred to the planning department in the middle 'twenties, becoming planning controller in 1940. He was appointed production manager in 1951, and in recent years has acted as technical consultant to a number of the company's factories in Europe and is also director of one of these factories. Mr. F. BULLOUGH, formerly assistant manager of the Leyland Spurrier Works in Lancashire, has been appointed factory manager of those works.

After almost 65 years' service with the Lancashire Steel Manufacturing Company, Limited, Warrington, Alderman JOSEPH POOLE has retired at the age of 80. He has been workers' representative of the Bewsey and Dallan branches of the standing committee of the Midland Iron and Steel Trades Association since 1914, and has in the course of his career been secretary of the local branch of the Iron and Steel and Kindred Trades' Association, a member of the executive committee and chairman of the No. 7 division area committee. He has been a member of Warrington Town Council since 1921, was Mayor in 1935-36, elected an alderman in 1936 and created Freeman of the Borough in 1956.

The following have been appointed managing directors of the five new subsidiaries of the Morgan Crucible Company, Limited, which have now assumed responsibilities for production, trading, research and development, on the parent company becoming a holding company on April 3: Mr. C. S. HARRIS, Morganite Carbon, Limited, Battersea, London, S.W.11; Mr. D. S. S. THYNNE, Morganite Crucible, Limited, Norton, Worcester; Mr. I. WESTON SMITH, Morganite Electroheat, Limited, Wandsworth, London, S.W.18; Mr. J. WALKER, Morganite Research & Development, Limited, Battersea, and Mr. J. H. BAUMANN, Morganite Exports, Limited, Battersea. Mr. Harris, Mr. Weston Smith and Mr. Walker are also directors of the holding company.

Crabtree's Record Order-book

Largest order-book in its history is reported by Mr. Charles H. Crabtree, chairman of R. W. Crabtree & Sons, Limited, engineers and makers of printing machines, of Leeds, who adds that it has every appearance of growing larger. During 1960 production was not able to meet demand, but new plant is being built in Leeds and Gateshead to overcome capacity shortage. Very large orders had been obtained in the last few weeks from Canada and the US worth over £1,000,000.

Practically the whole of post-war exports, which have never been less than 50 per cent. of production, have been financed between the company and its customers. A number of orders have been lost, says Mr. Crabtree, because of inability to come to terms with the Export Credits Guarantee Department.

Liquid resources enabled provision of funds to meet the cost of new buildings and plant and to declare an increased dividend "without any strain on resources."

Brown Bayley's Developments

Another Sheffield firm to announce a major development scheme is Brown Bayley Steels, Limited, whose £2,000,000 scheme has received planning approval from the Iron and Steel Board. It will take from four to five years to complete, and the finance will be raised from the company's own resources.

The scheme includes a 32-in. mill which will replace the existing 27-in. cogging stand and entails some rearrangement of furnaces, buildings and transference of plant. It is anticipated that output of alloy and stainless-steels will be stepped up to approximately 30,000 tons a year. When the scheme is complete, the company will have installed new melting plant, a new forge and a rolling mill within a 10-year period.

HALL-THERMOTANK, LIMITED—Mr. J. C. Akester has been appointed a director.

Giant Housing delivered to James Booth

A 180-ton mill-housing casting was delivered on April 17 to the Kitts Green, Birmingham, works of James Booth Aluminium, Limited, after a four-day road journey from Liverpool. It is the first of two housings for their new aluminium rolling mill—one of the largest of its type in Western Europe—and was transported on the largest trailer in the country.

The trailer used by the transport contractors, Robert Wynn & Sons, Limited, was a 200-ton 32-wheeler built by Cranes of Dereham. It was hauled from the Netherton, Liverpool, works of the English Electric Company, Limited, by three tractors—a 250 h.p. Pacific and two 200 h.p. Diamond Ts. The casting was off-loaded from the trailer in the docks at Liverpool and taken across the Mersey to Birkenhead for re-loading, lashed to the deck of the mammoth 200-ton floating crane which was towed by two tugs.

The combined weight of the trailer and casting was 205 tons, and although the journey from Liverpool to Birmingham is only about 90 miles it took four days, the route being selected specially to avoid narrow roads and bridges with weight restrictions. The casting, 35-ft. long, 15-ft. wide and 9-ft. high, is one of the heaviest loads ever transported on British roads.

On several bridges the speed was reduced to a crawl, and no other traffic was allowed on them at the same time. At various points, particularly in town and suburban areas, police held up the traffic while the trailer was taken against one-way traffic systems.

Last October the casting was taken by road from the Sheffield foundry of the English Steel Castings Corporation, Limited—where it was cast to the order of the Loewy Engineering Company, Limited, Bournemouth—for machining at Liverpool.

In the photograph the cortège carrying the 180-ton mill-housing casting is seen negotiating a roundabout on the outskirts of Lichfield (Staffordshire). The 90-mile journey took four days.

Silicon and Corrosive Wear

When discussion on the paper entitled "Influence of the Silicon in Cast Iron on Corrosive Wear" by R. Graham, B.SC., PH.D., O. S. Prado, M. H. Collins, B.SC., PH.D., E. A. Brandes, B.SC., and H. K. Farmery, M.A., PH.D., was reported in the JOURNAL, the written contribution of Dr. A. B. Everest, F.I.M., was not included as it was omitted from the advance copy of the discussion available to the JOURNAL at the time. It is now possible to make good this omission and Dr. Everest's comments on the original paper are printed below, together with the Authors' remarks relating to his contribution.

DR. A. B. EVEREST wrote that the evidence given in the paper concerning the effects of sulphuric-acid corrosion on cast iron for diesel-engine liners was impressive but did not seem to be completely convincing since much pertinent information had been omitted. It was indicated that the work reported was undertaken following rapid wear in diesel engines running on high-sulphur fuels in which corrosion was assumed to have been taking place. It would have been interesting to have seen the evidence that condensation was indeed possible during actual running and the positions in which the alleged corrosive wear was taking place. Some evidence on cylinder-wall temperatures would also have made the arguments more convincing*.

Other Factors

The present work had been conducted on a series of cast irons in which the silicon content was varied from approximately 0.5 to 3 per cent. and in which a given matrix structure and graphite size were maintained by modifying carbon in the range 4 to 2 per cent., that giving a constant carbon equivalent in the irons. Such measures had given the desired uniformity of matrix structure, but the Authors seemed to have overlooked the fact that there must inevitably have been other structural changes in the irons which could be of great signficance, not only in any wear tests but also in the corrosion experiments. Notable amongst those was the quantity of graphite present. It must be realized that, whilst carbon had been varied from 4 to 2 per cent. by weight, the variation in volume would have been from about 12 to 6 per cent. in the iron castings. That was a very considerable change when it was recalled that the corrosion resistance of cast iron was largely dependent on the protective effect of the graphite dispersed throughout the matrix. It was realized that the Authors were up against great difficulty in establishing conditions when one variable only could be studied, but it was felt that the objective could perhaps have been achieved in the present instance with less drastic subordinate effects.

* Since this communication was prepared the following paper has been published, which provides some of the supporting evidence asked for: Millington, B. W., 1960, *Engineer*, London, **21**, p. 871. "Temperature Measurements in a Doxford Cylinder Liner."

Mechanical Wear

Also little information was given on the full analysis of the irons and it was possible that the minor elements always present might have varied to a degree which would have influenced the results. All those factors must be borne in mind when it was remembered that whilst corrosion might be significant, probably the major factor in determining liner life was still mechanical wear. On that last point the paper did not quote any hardness figures for the different irons and it was suspected that there might be considerable variations which would be important under service conditions.

Alloy Irons

The present work pointed to the desirability of low silicon in the iron to meet the conditions arising from the use of high-sulphur fuels. If that conclusion was confirmed, it would probably be necessary to use alloy additions to maintain the optimum matrix structure, and it might be worth recalling that in the early days of the alloy-iron development, good results were shown for nickel and nickel/chromium alloy irons of low-silicon content in marine-diesel liners. There was, however, no suggestion that sulphuric-acid corrosion was a factor in liner wear in large diesel engines at that time. On the other hand, C. G. Williams of the then Research Association of British Motor and Allied Manufacturers (now the Motor Industry Research Association) had shown in 1933 the significance of sulphuric-acid corrosion as a factor in the wear of petrol engines under stopping and starting conditions, when condensation was liable to take place on standing. It was recalled that that effect was met by the use of the corrosion-resisting austenitic cast irons. It seemed possible that some such solution might be applied to meet present conditions, if in point of fact it was confirmed that liner wear was accelerated by sulphuric-acid corrosion under continuous running.

Authors' Reply

DR. R. GRAHAM, MR. O. S. PRADO, DR. M. H. COLLINS, MR. E. A. BRANDES, and DR. H. K. FARMERY wrote in reply that additional chemical analyses had been made to amplify information in Table 1 of the original paper, showing the proportion of graphite and combined carbon.

TABLE 8.—*Results of Further Chemical Analyses of Cast Irons.*

Melt No.	Total carbon.	Graphite carbon.	Combined carbon.
L.159	3.96	2.88	1.08
L.149	3.60	2.74	0.86
L.146	3.30	2.44	0.86
L.152	2.75	1.90	0.85
L.137	2.71	2.11	0.60
L.138	2.49	1.82	0.67
L.156	2.18	1.55	0.63
L.158	2.06	1.49	0.57

The figures in Table 8 show that the graphite did vary through the range of irons and that the variation in combined carbon was less. The volume of graphite, using Dr. Everest's analogy, changed from 8¼ per cent. to 4¼ per cent. by volume.

News in Brief

THE INDONESIAN GOVERNMENT has placed a £1,000,000 contract with the Rover Motor Company, Limited, of Solihull, Warwickshire, for 1,500 Land Rovers.

FINLAND will stage an industrial exhibition in Oslo some time in August-September this year at which the metal-using industry in particular will be strongly represented.

THE EDINBURGH FIRM of Bertrams, Limited, are to build cigarette-paper machinery worth $400,000 for an American paper company. Nine months ago Bertrams received big orders from Greece and Rhodesia.

PENTON PUBLISHING COMPANY, LIMITED, 2, Caxton Street, London, S.W.1, have recently issued their 1961 book list, which contains titles and prices of a number of American publications of particular interest to engineers and foundrymen.

AUSTIN & PICKERSGILL, LIMITED, shipbuilders, Sunderland, have received a £1,000,000 order for a 16,100-ton bulk carrier from the Pool Shipping Company, Limited. It is due for delivery in March, 1962, and is the third vessel to be ordered at Sunderland this year.

WEST GERMAN INDUSTRIALISTS and bankers have been reported to be interested in granting credits of US $10,000,000, and in supplying technical aid and machinery, to develop a copper mine in the Department of Los Andes, in the Argentine Province of Salta.

FERRANTI HAS SET UP a "northern computing service" at Manchester for industrial, scientific and commercial calculations. The service will be based at first on a Pegasus general-purpose digital computer at the company's head office at Hollinwood.

SHEFFIELD CHAMBER OF COMMERCE and the British Iron and Steel Federation are investigating the possibility of development of the Sheffield and South Yorkshire Navigation Canal at a cost of over £3,000,000 to make it a major transport facility.

DAVID BROWN INDUSTRIES, LIMITED, Huddersfield, are negotiating for the leasing of a factory on the Pallion Trading Estate, Sunderland, in which it is expected, about 400 people would be employed in making gears. Negotiations are reported to be in an advanced stage.

A NEW SCHEME OF AWARDS for suggestions for improving production at the Doncaster works of the International Harvester Company, Limited, has been started, and the first award, a cheque for £60, has been presented to Mr. Harry Milner, group leader of the crawler-tractor assembly.

NEW METALS AND PLASTICS developed in Birmingham were discussed at a one-day symposium attended by about 200 at the Chemical Engineering Department at Birmingham University. Organized by the Institution of Chemical Engineers, the gathering heard papers on ceramics, nickel-base alloys and glass-fibre laminations.

HAYWARD TYLER, LIMITED, one of the Stone-Platt Group, has been awarded a contract by Simon-Carves, Limited, for the supply of eight low-pressure and eight high-pressure glandless circulating pumps for the GEC-Simon Carves nuclear power-station under construction for the Japanese Atomic Power Company at Tokai Mina.

APPROVAL IN PRINCIPLE has been given for the erection of a new factory on a 20-acre site at Hednesford, Staffordshire, with an initial coverage of 60,000 sq. ft. to rehouse the Hednesford employees of the Fafnir Bearing Company, Limited, an American-controlled company with headquarters in New Britain, Connecticut, United States.

A SHEFFIELD TOOL MANUFACTURER bought the first "small exporter" policy designed by the Exports Credits Guarantee as a new form of insurance against non-payment for exports. Mr. Reginald Maudling, President of the Board of Trade, announced the new form on April 13 and the Sheffield firm bought the first policy the following day.

UNIVERSAL ENGINEERING (NOTTINGHAM), LIMITED, has been formed with £30,000 capital to carry on the business of casting and moulding of metal, etc. The subscribers, each with one share, are:—Malcolm Scott and P. N. Gerrard (solicitors), both of 1, Serjeants Inn, London, E.C.4. The first directors are to be appointed by the subscribers.

FERRANTI, LIMITED, are almost ready to move into their new £200,000 laboratories in Ferry Road, Edinburgh. The new building will contain the applied electronics division which is at present housed in the building at the west side of Crewe Toll, and other departments will have more room for their work on electronic and inertial navigation systems.

AN ORDER for a cargo motorship of 13,100 tons dw, valued at more than £1,000,000 has been placed with Lithgows, Limited, Port Glasgow, by the Currie Line, Limited, Leith. Following the recent policy of the builders the contract is on a fixed price, fixed delivery basis. Propelling machinery will be supplied by John G. Kincaid & Company, Limited, Greenock.

CONVEYANCER FORK TRUCKS, LIMITED, Warrington, and the Raymond Corporation, New York, are forming a new company, Conveyancer-Raymond, to manufacture reach, straddle, and pallet trucks and distribute them in Britain and other markets. The new company will be an associate of Electro-Hydraulics, Limited, a subsidiary of the Rubery Owen organization.

THE MANUFACTURE OF STEAMROLLERS is being undertaken for the first time in South Africa. Announcing the programme in Johannesburg, Mr. R. H. Munro, managing director of Aveling-Barford (Pty), Limited, stated that machines of eight different sizes were being made, ranging from 6 to 18 tons. The series would be extended shortly to include steamrollers of other types and sizes.

EXPORT ORDERS received during the past few weeks by Thomas Smith & Sons (Rodley), Limited, manufacturers of cranes and excavators, Yorkshire, include nine excavators for Switzerland and a truck-mounted 15-ton crane for North Borneo. A further order from New Zealand for three excavators brings the total number of the company's machines in New Zealand to more than 170.

A NATIONAL INSTITUTE for training industrial engineers is to be set up in Bombay this year. This was stated by the Minister of Industry, Mr. Manubhai Shah, while inaugurating the annual conference of the local productivity council in New Delhi on April 12. The institute is to be set up with assistance from the International Labour organisation and the U.N. Special Assistance Fund.

EMPLOYEES in railway running sheds in Great Britain will be covered by the safety, health and welfare provisions of the Factories Acts from July 1 next. This is the effect of an Order, made by Mr. John Hare, Minister of Labour, and published on April 14, bringing into operation section 25 of the Factories Act, 1959, which extends the application of the Acts to these sheds.

HADFIELDS, LIMITED, Sheffield, despatched from their

News in Brief

East Hecla works last week the biggest bucket in the world. It is built for a dragline and weighs 28 tons and 60 people can stand in it. It is for use in Glamorgan, which involves a week's journey by road. The bucket, a 40 cu. yd. heavy-duty bucket, is 125 in. wide inside its mouth, and one of the bulkiest items ever made at the East Hecla works.

A COURSE OF LECTURES on industrial and factory law will be given by Mr. Harry Samuels, under the auspices of the Industrial Welfare Society, at 48 Bryanston Square, London, W.1, on May 9-11. The course covers the legal groundwork necessary to industrial managers and executives and is also intended as a refresher course. Further particulars may be obtained from the secretary of the Society.

A FILM entitled "For Mechanical Advantage" will be presented by W. H. Allen Sons & Company, Limited, at the Engineering, Marine, Welding and Nuclear Energy Exhibition being held at Olympia, London, from April 20 to May 4. The film, which lasts for 25 minutes, will be shown from the company's stand (1, Row D, ground floor, Grand Hall), and will deal with the development and application of epicyclic gearing to marine and industrial use.

SHEFFIELD FIRMS invited to supply goods for the British stand at the British Columbia Trade Fair in Vancouver in May include Viners, Limited, and Walker & Hall, Limited, in the metal and tableware section, and in cutlery, A. H. Bisby & Company, Limited, I. S. Dearden & Sons, Limited, John Sanderson & Son (1929), Limited, and Walker & Hall. The Council of Industrial Design will mount the display at the invitation of the Board of Trade.

AT THE ENGINEERING, MARINE, WELDING and NUCLEAR ENERGY EXHIBITION, being held at the Olympia until May 4, Murex Welding Process Limited, will be showing (2, Row W, ground floor, Empire Hall) a 6-ft.-long model of Britain's first nuclear submarine H.M.S. Dreadnought. Also displaying their products will be Vacu-Blast, Limited (6, Row W, ground floor, Empire Hall) who supplied mobile dust-free shotblasting equipment for plate descaling on the Soviet vessel "Moskva"—reputed to be the largest diesel-driven ice-breaker in the world.

CALOR-MIDGLEY, LIMITED, Sheffield, have opened new premises in Carlisle Street, Sheffield. The firm now not only provides delivery of Propane gas in bulk but also has a seven-day collect and return service. The original firm of Lee-Midgley, Whitehead & Company, Limited, which was formed in 1951, was acquired by Calor Gas (Distributing) Company, Limited, in November, 1959. In the 12 months up to the end of December, 1960, the new company's sales of Propane gas in cylinders more than doubled the sales of the original company.

THE BRITISH ELIMINATING CONTEST in the international competition for apprentice moulders (not to be confused with the European Foundry Apprentice Competition) took place at Newton Chambers & Company, Limited, Thorncliffe, Sheffield, on April 14. Seven of the 10 competitors were from Sheffield and of those seven, four were from Newton Chambers & Company. The tests, held in the company's foundry training centre, were in iron and light-alloy moulding. The judges were Mr. J. McPherson; foundries manager, Mr. H. Pinder, foundry instructor to Thorncliffe apprentices, and Mr. G. H. Brown, a member of the staff at the National Foundry College, Wolverhampton, who will report the results to the City and Guilds of London Institute before they are made public.

Obituary

The death has occurred at the age of 74 of Mr. ALBERT JOHN LLOYD, chairman of John Lloyd & Sons (Engineers), Limited, of Frederick Street, Birmingham.

Mr. LONSDALE COOPER HARTLEY, general manager and a director of C. Whittaker & Company, Limited, brickmaking machinery manufacturers, Dowry Street, Accrington, has died at the age of 60.

Mr. C. E. SMITH, managing director, Smith's Diecast Products, Limited, Napier Works, Hungeston Street, Birmingham, and of the Aston Cross Manufacturing Company, Limited, has died at the age of 54.

Mr. E. H. GRATTON, senior director, D. T. Gratton & Sons, Limited, agricultural engineers, Wide Bargate, Boston, Lincolnshire, has died. The firm was founded by his father and Mr. Gratton joined when he left school.

Mr. J. F. DREW, deputy transport manager at Stanton Ironworks Company, Limited, near Nottingham, has died in Derby City Hospital, at the age of 60. He had been associated with the company for 45 years.

Mr. HUBERT C. FRENCH, who brought the Ford Motor Company to Australia, died at Geelong at the age of 78. He was managing director of the Ford Motor Company of Australia Pty., Limited, from its inception in 1925 until he retired in 1950.

Mr. HUBERT THOMAS WINTERTON, general manager and director of W. Cumming & Company, Limited, foundry facings manufacturers, Whittington, Chesterfield, has died at the age of 59. He had been associated with the company for some 35 years.

A former foreman of William Asquith, Limited machine-tool manufacturers, Halifax, Mr. ERNEST LAW has died at the age of 84. After retirement from Asquith's in 1941, Mr. Law started his own engineering firm of Turner, Law & Mitchell at Sowerby Bridge.

The death has occurred of Mr. J. G. MACQUEEN, an employee of Allied Ironfounders, Limited, for more than 50 years. He joined the Falkirk Iron Company, forerunner of Allied Ironfounders, as an office boy in 1908, and in 1938 removed to the group's plant at Ketley, Shropshire, where he was sales executive when he retired last year.

The death has occurred, at the age of 69, of Mr. GEORGE WILLIAM STEVENS, formerly manager of the Royal Ordnance Factory, Lower Darwen (Lancs). He was appointed assistant manager in 1940, becoming manager two years later. In 1942, he was promoted to assistant superintendent, holding the position for four years before reverting to manager in 1946.

The death is reported of Mr. JOHN C. COLEMAN, managing director of Ardrossan Dockyard Company, Limited. He went to Ardrossan in 1928 as engineering manager, was subsequently appointed yard manager, and in 1947 became managing director. He was a member of the Institute of Marine Engineers and a member of the Institution of Engineers and Shipbuilders in Scotland.

Mr. WILLIAM ROBB, who has died at the age of 56, was a moulder with the Falkirk Iron Company, Limited, until 1946, when he was appointed foundry manager with an associate company, McDowall Steven & Company, Limited. He continued with this company until 1958, when the works were closed down. Mr. Robb resumed his position with the company when the works were re-opened in 1960.

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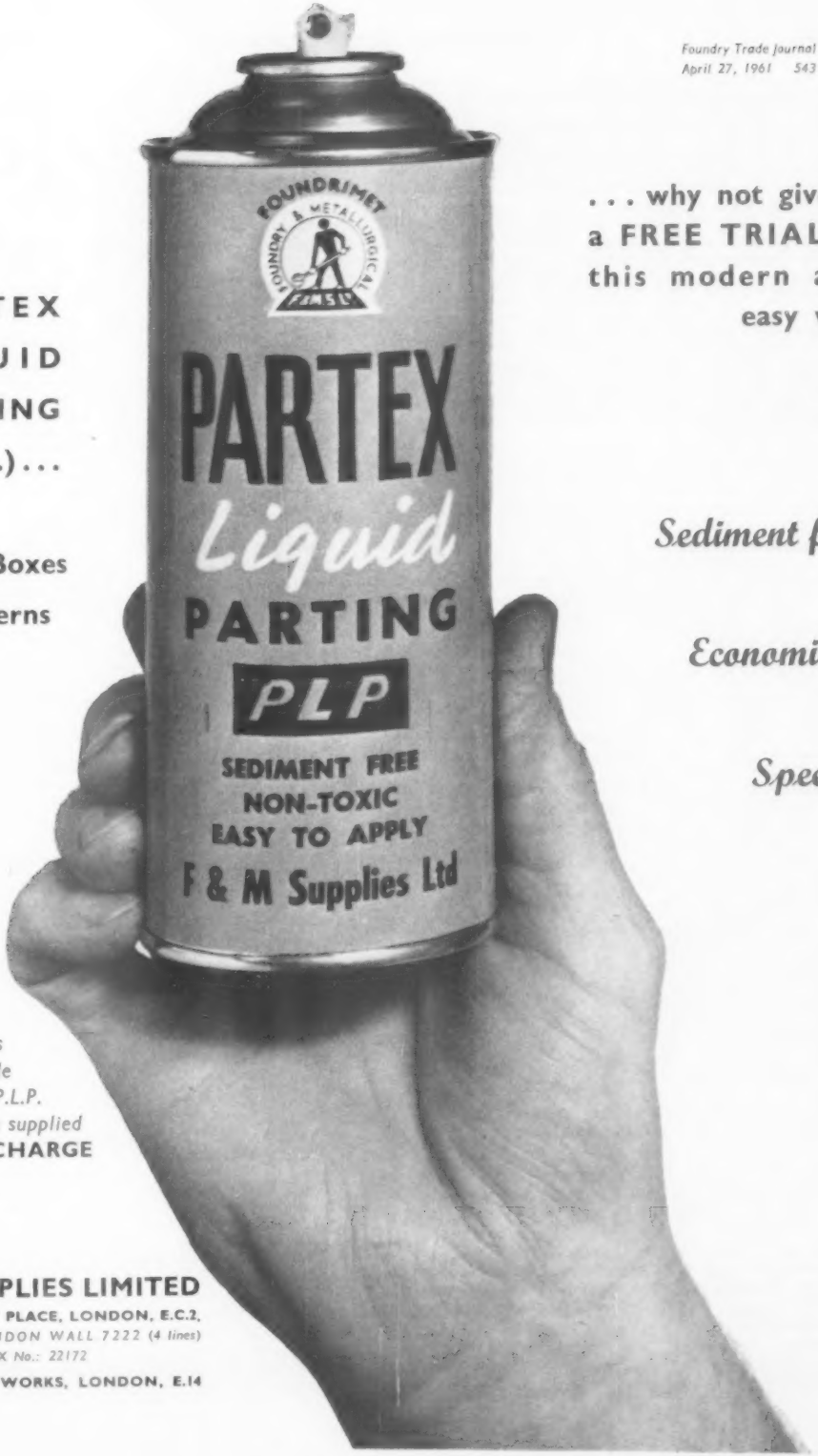

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Company News

New Funds for Hadfields

A group of nine industrial and financial companies is to provide £2,616,184 of new capital for Hadfields, Limited, the Sheffield special steel manufacturers and engineers, by subscribing for that number of £1 ordinary shares at par. The group is headed by Sir Peter Roberts, MP, chairman of the Wellman Smith Owen Engineering Corporation, Limited, and Newton, Chambers & Company, Limited, two of the industrial members, which will each provide about £400,000. There are three other industrial members, including Barrow Barnsley (Holdings), Limited, which will supply some £250,000.

The industrial companies will supply half the new capital and the remainder will be subscribed by Securities Agency, of which the chairman is Mr. Harold Drayton, and which has boardroom connections with Newton Chambers.

Under the scheme, Hadfields ordinary capital will be raised to £6,500,000, and the group, acting as a consortium, will have a 41 per cent. holding in the increased equity. Sir Peter Roberts will become vice-chairman of Hadfields, and four other members of the group may join the board. Dividend earnings of the company have declined from 24 per cent. five years ago to 5 per cent. last year. The Millspaugh, Limited, paper machinery subsidiary is still making a loss, and no improvement in group profits is expected in the year ending this September.

Acceptance Urged

Lord Dudley Gordon, chairman of Hadfields, urging shareholders to accept the proposals at an extra-ordinary meeting to be called as soon as possible, states that the board considers the close association with the industrial members, the addition of new capital, and the reinforcement of management, will all be of benefit to the shareholders and employees. For some time the board has been concerned with the need for additional finance for modernization and development and for increased working capital.

At a Press conference in London on April 19, Lord Dudley Gordon said that the link with the industrial members of the group would allow a useful exchange not only in manufacture but also in know-how and research. It was intended that Millspaugh should be as fully integrated as possible with Hadfields.

Sir Peter Roberts stated that talks on the proposal began early this month when Hadfields ordinary shares stood at 18s. 6d. A suggested price of par seemed a reasonable value. He thought it might be three to four years before the full effects of the intended arrangements and planned developments would be seen.

It was not intended at this stage to seek a Stock Exchange quotation for the new shares.

CHAMBERLIN & HILL, LIMITED, ironfounders, of Walsall (Staffs)—An extraordinary meeting is called for May 4 to create capital and to effect the one-for-one scrip issue to holders of April 22.

HUNSLET (HOLDINGS), LIMITED—The whole of the issued share capital in Materials Handling Equipment (Great Britain), Limited, suppliers of side-operating fork-lift trucks, of Maidenhead, has been acquired for £21,500 cash.

BELLS ASBESTOS & ENGINEERING (HOLDINGS), LIMITED—The final dividend of 15 per cent. on capital enlarged by a two-for-five rights issue makes an increase of 2½ per cent. over the forecast final. Group pre-tax profit rose to £737,193 (£580,009).

GLOVER & MAIN, LIMITED—Group profits, including those of the newly-acquired subsidiaries, fell sharply in 1960 to £282,563 (£432,930). The final dividend is held at 9d. per 10s. share on capital increased by a one-for-three rights issue, making 11d. per share as previously.

BABCOCK & WILCOX, LIMITED—Group profit, before tax, shows an improvement at £890,584, against £523,154, but there is a charge of £157,944 for UK tax, against the previous year's credit of £150,137. A final dividend of 4½ per cent. maintains the total for 1960 at the reduced 9 (13) per cent. rate paid for 1959.

ALLEN WEST & COMPANY, LIMITED, electric control and switchgear manufacturers, of Brighton—Final dividend is recommended of 8½ per cent., making 13½ per cent. for the year ended January 31, against 12½ per cent., plus a bonus of 1 per cent. Group profit for the year was £407,485 (£408,168), after tax of £242,595 (£241,132).

PRESSED STEEL COMPANY, LIMITED, Cowley (Oxon)—Group profit in 1960, before tax, fell to £2,925,061 (£4,829,085), but, with a final of 21 per cent., the dividend is maintained at 30 per cent. on increased capital. This is as forecast with the May rights and debenture conversion issues. After a reduced tax charge of £1,052,534 (£2,367,579) the net profit is down to £1,872,527 (£2,461,506).

Steelmaking-plant Order for Head Wrightson

An order for a basic oxygen steelmaking plant—the first export order to be secured by a British firm for the supply of a complete plant using any of the new oxygen steelmaking processes—is announced by Head Wrightson (Australia) Pty., Limited, a subsidiary of Head Wrightson & Company, Limited. It is included in orders won in the face of strong competition and valued at about £3,500,000 from the Broken Hill Proprietary Company, Limited, and from Australian Iron & Steel, Limited. They include the design, manufacture, and erection of a scree-ore treatment plant, a basic oxygen steelmaking plant, and a tinplate cut-up line.

The scree-ore treatment plant will treat 1,200,000 tons per year of scree deposits taken from the flanks of Iron Knob and will have an output of 800,000 tons of concentrate averaging about 60 per cent. iron content. The engineering for this plant will be carried out by Head Wrightson Minerals Engineering, Limited, Sheffield.

The basic oxygen steelmaking plant, which will have an output of about 500,000 tons of steel per year, will be installed at Whyalla in South Australia and will be engineered in the UK by Head Wrightson Iron & Steel Works Engineering Limited, Thornaby-on-Tees.

For the tinplate cut-up line Head Wrightson is responsible for the supply of two 100-ton basic oxygen furnaces together with the oxygen lancing equipment, fume ducting and fume-conditioning equipment, the steel plant buildings, together with the hot metal and slag ladles, steel transfer cars, etc. The engineering for the whole of the tinplate line and part of the equipment will be supplied by the Head Wrightson Machine Company, but the major part of the equipment will be manufactured in Australia. Equipment and services valued at almost £1,000,000 sterling, will be supplied from the Head Wrightson Works on Tees-side.

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Publications Received

European Foundry Industry, published by the European Committee of Foundry Associations and available from the constituent Associations (in the UK, from the Council of Ironfoundry Associations, 14, Pall Mall, London, S.W.1, price 6s., post free).

For the past seven years, the principal foundry industries of Western Europe have collaborated closely in matters of common concern—a natural development in view of widespread interest in European countries for or against economic co-operation. The organ of this collaboration is the European Committee of Foundry Associations,* of which the United Kingdom foundry industry—ferrous and non-ferrous—is in membership.

This week, the European Committee has issued an attractive tri-lingual (English, French, German) brochure to foundrymen at large and to other industrialists, technicians and scientists, to explain what it is and what it does.

The brochure is illustrated, and outlines briefly but clearly the economic importance of the contribution to industry made by Europe's foundries and their social importance as a means of livelihood to several hundred thousand workpeople. It emphasizes the fact that castings enter in some way, directly or indirectly, into people's day-to-day lives at very many points.

At present, in addition to the UK, the Foundry Associations of Austria, Belgium, Denmark, France, Germany, Italy, Luxembourg, the Netherlands, Spain and Switzerland are members of the European Committee; Sweden is an interested observer at the meetings. As the brochure explains, the governing body of the Committee is its general assembly, which meets twice yearly, by custom in the country whence the president for the time being is chosen. In the chair at the present is a Spaniard (Mr. Dionisio Escorsa), but it seems likely that the office will be held by a British foundryman next year, or in 1963, a point which will probably be decided at the Committee's next general assembly, in Barcelona, April 24 to 25.

Work done by the European Association covers, among other subjects, training, productivity, market development and technical organization, health and safety and—important in the present-day context of negotiations affecting the Six and the Seven—European institutions. For each subject a sub-committee is responsible. The different countries provide the necessary secretariats for each such body; thus, Great Britain sponsors that on market research, and will submit a detailed and comprehensive report on factors governing the uses and consumption of castings to the plenary meeting at Barcelona next month.

Data Sheets on Steel Castings. Published by the Steel Castings Development Committee, British Steel Founders' Association, 13, Broomgrove Road, Sheffield, 10.

These data sheets have been compiled by a joint committee of the British Steel Founders' Association and the British Steel Castings Research Association. The first five to be published carry data on (1) Low-temperature properties of plain carbon steel castings; (2) low-temperature properties of pearlitic manganese steel castings; (3) low-temperature properties of low- and medium-alloy steel castings; (4) magnetic properties of plain carbon steel castings, and (5) fatigue properties of steel castings.

Information for the users of steel castings is given in tables and graphs, but not all readers are capable of extrapolating from such media, and it might have been worthwhile to have added a note that the best material for such and such components to operate at say 350 deg. C. is perhaps a 2½ Ni/Cr/Mo steel, or some similar type. The most useful sheet is No. 5 covering fatigue, and after digesting it the designer should know exactly where he stands *vis-a-vis* wrought material. The data sheets are well worthy of a place in any design office, as really useful references sources to data of this sort are few and far between.

Practical Training in Production Engineering. Published by the Institution of Production Engineers, 10 Chesterfield Street, London, W.1.

It is almost axiomatic that the precise statement of a problem brings one more than half-way to its solution. This brochure clearly states the basic objectives necessary for the adequate practical training of a production engineer and then leaves to the various bodies concerned the task of evolving the conditions of entry and the syllabus to be followed.

House Organs

GEC Journal, Vol. 28, No. 1. Published by the General Electric Company, Limited, Magnet House, Kingsway, London, W.C.2.

The frontispiece of this issue is a picture of the new chairman, Mr. Arnold Lindley. It is interesting to find that in 1949 he was the general manager of the Frazer & Chalmers works at Erith. Also in this issue is an article on the reorganization of the company's research laboratories at Wembley which will now be known as the Hirst Research Centre, perpetuating the name of the founder of the company, the late Lord Hirst.

Survey, Vol. 1, No. 1. Issued by W. & T. Avery, Limited, Birmingham.

This is a well-presented magazine, which emphasizes the elementary dictum that control starts with the intelligent use of weighing and measuring machines. The brochure opens with a description of the stores department at the Staines works of Petters, Limited, where materials are not only weighed but are also counted automatically. Other aspects covered are the testing of aeroplane components, zinc-sheet production, flour-milling and brush-making.

Technical Notes, 218. Published by CIBA (A.R.L.), Limited, Duxford, Cambridge.

Captioned "'Araldite' in Museum Work," this issue of the *Notes* contains much of interest to those concerned with archaeology and the repair of ceramic masterpieces. There is reported one outstanding repair successfully carried out on a 14th-century canoe which had been submerged for hundreds of years. After repair, it was possible to see just how this unique craft was designed and constructed.

Broomwade News Bulletin, Vol. 24, No. 1. Published by Broom & Wade, Limited, High Wycombe, Bucks.

The appointment of Mr. R. H. Lowman as export sales manager of the company is announced in this issue, and an extract from the address of the chairman, at the annual general meeting is also recorded.

* Not to be confused with the *International* Committee of Foundry *Technical* Associations, which has for its main objective the staging of annual congresses on a world basis —Editor.

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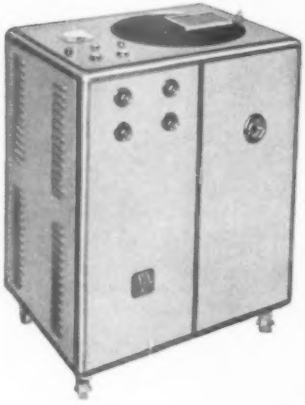

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Raw Material Markets

Iron and Steel

There is little change in the pattern of business at the ironfoundries, and production of castings is on similar lines to those which have governed the industry for some time. The engineering and speciality foundries are much better employed than other units, and their outputs of high quality castings are maintained at substantial levels. Those catering for the motor vehicle trade continue to be well employed, the demand for castings, although not so heavy as it has been, enabling most of the foundries to maintain a full working week. Good demands also continue to be made from other trades for high duty castings, and overall the foundries supplying these are able to maintain good outputs.

For light castings the call is not so favourable, and the foundries supplying the domestic utensil trade have capacity available for more work. The building trades are utilizing fairly good tonnages, and the foundries connected with them are able to obtain reasonably good outputs. More work is also needed by most of the jobbing and textile foundries.

There is no scarcity in the supply of any grade of pig-iron, and producers could step up deliveries if needed. Large quantities of basic pig-iron continue to be taken up by the steelworks, whose requirements for both consumption and stock are readily satisfied, and production from the blast furnaces now burdened for this iron can be increased as demands warrant. The low phosphorus irons continue in biggest demand, and the combined outputs of the several furnaces producing this grade are more than adequate to satisfy the needs of consumers.

The engineering and speciality foundries are also able to obtain all the hematite they require, and those foundries utilizing the refined irons are readily supplied. The light, jobbing, textile and some of the engineering foundries are taking up fairly good tonnages of high phosphorus irons, but these demands do not absorb fully current outputs, apart from the stocks held by the furnaces.

The call for heavy cast-iron machinery scrap is not easily satisfied as arisings are insufficient to meet demands fully. Other grades are more plentiful. Foundry coke deliveries are satisfactory and ganister, limestone and firebricks are in good supply.

Many of the re-rollers report a decline in business for small bars, light sections and strip and order-books for these products are well below former levels. The work now on hand enables the mills to obtain fairly good outputs, but to maintain these an increase on present demands will be required. There continues a good demand for reinforcing rods and bars.

The re-rollers are well provided with mild steel semis, of which they hold good stocks, and there is little demand on home steelworks for deliveries. It is expected that in the near future there will be bigger calls for supplies as stocks are reduced, and in the absence of imported steel semis reliance will have to be made entirely on home steelworks for supplies.

The re-rollers are readily accepting from the steelworks all arisings of suitable defectives and crops.

Non-ferrous Metals

Tin, once again is outstanding in the non-ferrous metal markets on both sides of the Atlantic and in the East. Indeed, if the recent reassessment of the deficit in supplies expected this year becomes a reality, the price of the metal may well go beyond the reach of the Buffer Stock Manager. In short, it may go too high for its own good and lead to the same kind of situation as obtained some years ago when its price was such as to cause industry to design away from its use and employ substitutes wherever possible.

Certainly the tin markets are active. London is steadily busy with inquiries from all sources and without much intervention by the Buffer Stock Manager the metal is becoming difficult to find to meet orders. Under these conditions the quotation for cash is firm around £845 a ton and the three months price over £850 a ton. The US market is also active and the price has risen to over $1.08 a pound. Singapore is a consistently good market.

Copper is trying to go ahead without much success. However, expectation of improvement to come is sustaining the price and the market is more sensitive to bullish influences than those which are adverse. At present, the world picture is anything but bright. Statistics for March show that world production is on the increase (at a time when producer cutbacks in production should be showing some results), and while shipments are also better they are not sufficient to stop stocks rising. The US figures are more satisfactory from a stock point of view but production is still rising.

In London the market can be described as quietly steady with exceptionally good demand occasionally from the Continent. The price is not moving much either way from £230 a ton. In the US demand is satisfactory, but not good enough to support the previous rumour of an early increase in the custom smelter price from its present level of 29 cents a pound the same as that quoted by the producers. The Japanese Government has made available the sum of $16,750,000 with which to buy copper and demand from this source in the weeks ahead may prove a valuable sustaining factor in the market.

Lead is quietly steady in London with only an occasional burst of demand from the Continent. The price is fairly steady around £68 a ton. The US market is slow and the price unchanged at 11 cents a pound. Zinc is featureless in London with the quotation fairly steady around £84 a ton. The US market is dull and the price unaltered at 11½ cents a pound.

Catalogues

Diesel Engines and Machine Tools. Number 217 of *Crossley Chronicles* is devoted entirely to reviewing the display of Crossley Brothers, Limited, at the 1961 Engineering, Marine, Welding & Nuclear Energy Exhibition, where from April 20 to May 4 the firm occupies two side-by-side stands in the Grand Hall. In addition to two diesel models, the brochure details and illustrates an alternator and other power units, a screw-thread hammering machine and a double-ended taper turning lathe—both the latter being new.

Belt Conveyors. In publication No. BA79, Turner Brothers Asbestos Company, Limited, Rochdale, detail the range of qualities and types of conveyor belts available, and tell something of the incorporation in them of synthetic fibres. A description is given of the service the company renders to customers.

Shell Coremaking. No fewer than nine leaflets covering shell coremaking machines have been received from Ernest Fairbairn, Limited, Manfield House, 376/379 Strand, London, W.C.2, who are now sole agents for Dependable Shell Core Machines, Incorporated, of Oregon, USA.

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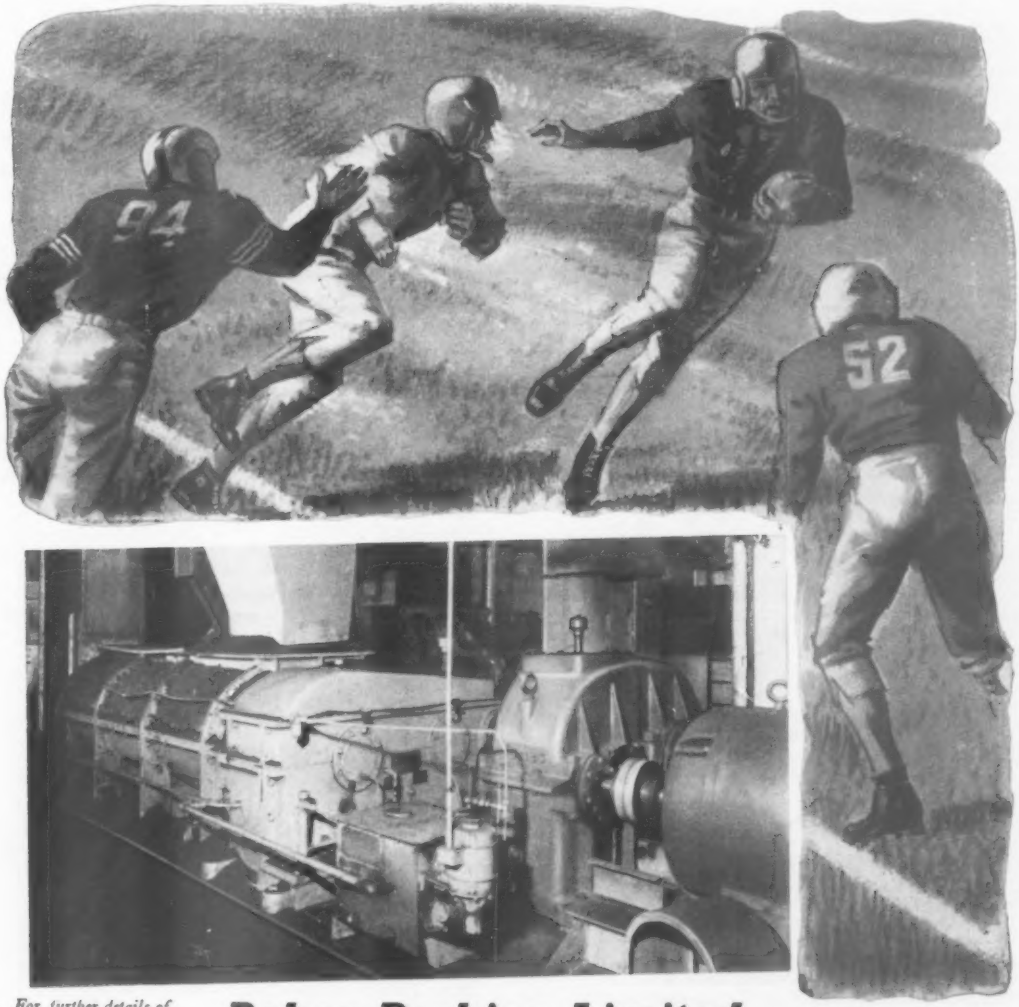

For further details of this and other foundry machinery write to:

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BPF9

Current Prices of Iron, Steel, and Non-ferrous Metals

(Basis prices, delivered unless otherwise stated)

April 26, 1961

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over Middlesbrough, £21 17s. 0d.; Birmingham, £21 9s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P 10-ton lots or over, £23 5s. 0d., delivered Birmingham £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d. South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si less than 2 per cent, S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over; N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s. 0d.; Birmingham, £25 13s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(per ton unless otherwise stated, delivered)

Ferro-Silicon (6-ton lots and over).—45 per cent. Si £45 0s. 0d. to £48 0s. 0d., scale 15s. 0d. per unit, lumpy. 75 per cent. Si, £62 0s. 0d. to £66 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s.10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 9s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 12s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £81 10s. 0d. to £84 10s. 0d., basis 60 per cent. Cr scale 27s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £79 0s. 0d. to £82 10s. 0d., basis 60 per cent. Cr, scale, 27s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 11d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free £275 0s. 0d.; 96/98 per cent., £285 0s.0d.

Ferro-columbium.—65/67 per cent. Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £58 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t.s. 100 tons and over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 100 tons and over, £32 5s. 6d.; hard (0.41 to 0.60 per cent. C), 50 tons and over, £33 17s. 0d.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting, 50 tons and over, £35 4s. 6d. SIEMENS MARTIN ACID (50 tons and over): Up to 0.25 per cent. C, £40 11s. 0d.; silico-manganese, £43 4s. 0d

Billets, Blooms, and Slabs for Forging and for Stamping (50 tons and over).—BASIC: Soft, up to 0.33 per cent. C, £37 0s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £38 2s. 6d.; acid, up to 0.25 per cent. C, £41 14s. 0d.

* Average 68-70 per cent.

FINISHED STEEL

Heavy Plates and Sections (50 tons and over).—Ship plate (N.-E. Coast), £40 7s. 0d.; boiler plates (N.-E. Coast), £42 17s. 0d.; floor plates (N.-E. Coast), £41 16s. 0d.; angles (N.-E. Coast), £38 1s. 6d.; joists (N.-E. Coast), £37 17s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 6d.; under 4 tons to 2 tons, £41 3s. 6d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £66 7s. 0d.; nickel-chrome, £97 1s. 0d.; nickel-chrome-molybdenum, £109 14s. 0d., in lots of 25 tons and over.

NON-FERROUS METALS

Copper.—Cash, £229 15s. 0d. to £230 0s. 0d.; three months, £231 15s. 0d. to £232 0s. 0d.; settlement, £230 0s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 2½d. per lb.; rods, 244s. 6d. per cwt. basis; 20 s.w.g., 279s. 6d. per cwt.

Tin.—Cash, £843 0s. 0d. to £844 0s. 0d.; three months £851 10s. 0d. to £852 0s. 0d.; settlement, £844 0s. 0d.

Lead (Refined Pig).—Second half April, £67 15s. 0d. to £68 0s. 0d.; second half July, £68 17s. 6d. to £69 0s. 0d.; settlement, £68 0s. 0d.

Zinc.—Second half April, £83 12s. 6d. to £83 15s. 0d.; second half July, £83 12s. 6d. to £83 15s. 0d.; settlement, £83 15s. 6d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £121 17s. 6d.; rolled zinc (boiler plates), all English destinations, £120 12s. 6d.; zinc oxide (Red Seal); d/d buyers' premises, £97 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10d. per lb.; sheets to 10 w.g., 200s. 0d. per cwt.; wire, 2s. 8½d.; rolled metal, 200s. 0d. per cwt.

Brass (Brazing).—BS1400, B3, £179; B6, £227.

Brass (High Tensile).—BS1400, HTB1, £197; HTB2 £214; HTB3, £232.

Gunmetal.—BS1400, LG2, £223; LG3, £232; G1, ½%, £296; G1, 1%, £286.

Phosphor Bronze.—BS1400, PB1 (AID released), £313 BS1400, 90/10/1, £302.

Leaded Phosphor Bronze.—BS1400, LPB1, £244.

Phosphor Bronze Strip, etc.—Strip, 291s. 6d. per cwt.; wire, 4s. 1½d. per lb.; rods, 3s. 4½d.; tubes, 3s. 4½d.; chill cast bars, solids 3s. 4d.; cored 3s. 5d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 10½d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 3½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 2½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb.; Antimony, English, 99 per cent., £230 0s. 0d. Quicksilver, ex-warehouse, £67 0s. 0d. Nickel, £600 0s. 0d. Aluminium, ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £247; AB2, £255.

51 Years with Leyland's

Headquarters chief superintendent of Leyland Motors, Limited, Lancs, and first "boss" of the company's present chairman and managing director, Sir Henry Spurrier, Mr. C. H. Rimmer has retired after 51 years' service with the firm. Mr. Rimmer, who joined the company in 1910 as a fitter, was made chief tester in 1912, and it was about this time that Sir Henry Spurrier, then serving a student apprenticeship, came to him for instruction. Treating him as he treated all newcomers, Mr. Rimmer immediately started him at the bottom by giving him the dirtiest of jobs! In 1942, Mr. Rimmer was appointed superintendent of Leyland's engine factory at Farington and in 1952 to his present position. During his 51 years he has seen the company grow from two small workshops covering just over five acres into five Lancashire factories on an area of about 340 acres.

FTE & SA Export Bulletins

The Foundry Trades' Equipment and Supplies Association from 94/98 Petty France, London, S.W.1, has commenced publication of a series of *Export Bulletins* which are circulated to their members. The first of these *Bulletins*, dated March 29, published an article entitled "Export Documentation—Is it Really so Difficult?" by Mr. R. K. Bridges, executive editor, Croner's Reference Book for Exporters. *Bulletin No. 3*, dated April 13, consisted of an article by Mr. D. J. Shearer, secretary, Institute of Shipping and Forwarding Agents, entitled "The Shipping and Forwarding Agent can help solve your Export Problems."

Increases in Capital

BRASS FOUNDERS (SHEFFIELD), LIMITED, increased by £50,000 in £1 founders shares, beyond the registered capital of £50,000.

A.J.W. PRECISION MACHINERY, LIMITED, Ashford (Middx), increased by £1,400 in £1 shares, beyond the registered capital of £100.

HALLAMSHIRE STEEL COMPANY, LIMITED, Sheffield, increased by £25,000 in £1 ordinary shares, beyond the registered capital of £375,000.

PRESSED STEEL COMPANY, LIMITED, Cowley, Oxford, increased by £2,000,000 in 5s. ordinary shares, beyond the registered capital of £7,000,000.

R. HEMMINGFIELD, LIMITED, ironfounders, etc., of Middlesbrough, increased by £4,000 in £1 ordinary shares, beyond the registered capital of £2,000.

S. CROWTHER (ROYTON), LIMITED, ironmasters, etc., of London, E.C.2, increased by £20,000 in £1 ordinary shares, beyond the registered capital of £10,000.

STEEBOR DIECASTING COMPANY, LIMITED, Radcliffe (Lancs), increased by £190,000 in 5s. ordinary shares, beyond the registered capital of £60,000.

HARRISON (BIRMINGHAM), LIMITED, brassfounders, etc., increased by £504,000 in 5s. ordinary shares, beyond the registered capital of £546,000.

FRY'S (LONDON), LIMITED, engineers, etc., of Crawley (Sussex), increased by £48,000 in 2s. ordinary shares, beyond the registered capital of £100,000.

HEENAN GROUP, LIMITED, engineers, etc., of Shrub Hill (Worcs), increased by £800,000 in 5s. ordinary shares, beyond the registered capital of £1,600,000.

CRADLEY HEATH MANUFACTURING COMPANY, LIMITED, tube manufacturers, etc., increased by £100 in £1 ordinary shares, beyond the registered capital of £10,000.

KELHAM ISLAND STEEL WORKS, LIMITED, Sheffield, increased by £45,000 in 3,600 preference and 41,400 ordinary shares of £1, beyond the registered capital of £5,000.

BARWORTH HOLDINGS, LIMITED (formerly Barworth Steel Works, Limited), Sheffield, 3, increased by £95,000 in £1 shares, beyond the registered capital of £5,000.

CROWN FITTINGS (WALSALL), LIMITED, ironfounders and masters, etc., of Walsall, increased by £5,000 in £1 ordinary shares, beyond the registered capital of £2,500.

W. TYZACK SONS & TURNER, LIMITED, manufacturers of files, saws, etc., of Sheffield, increased by £50,000 in 5s. ordinary shares, beyond the registered capital of £200,000.

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CLASSIFIED ADVERTISEMENTS

PREPAID RATES: **Twenty words for 10/- (minimum charge) and 4d. per word thereafter. Box numbers 2/6 extra per insertion (including postage of replies). Situations wanted 2d. per word throughout.**

Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House, 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

FOUNDRY FOREMAN / MANAGER, with comprehensive experience of medium heavy jobbing, grey and high duty irons, cupola and sand control, quotations, pattern design, methods, seeks post offering scope for initiative. Box FF710, FOUNDRY TRADE JOURNAL.

AUSTRALIAN (40), M.I.B.F., arriving U.K. shortly, wide practical and technical experience in ferrous and non-ferrous metals. Past 7 years executive positions. At present in Far East. Seeks permanent position, with housing assistance. Box AM704, FOUNDRY TRADE JOURNAL.

PLANT ENGINEER (41) seeks new post in large Modern Mechanised Foundry. Good background and experience embracing installation, maintenance, planning and development. Qualifications include: M.I.Plant E., M.I.B.F. Salary required: £2,000 p.a. Housing assistance, car, etc. Box PE671, FOUNDRY TRADE JOURNAL.

FOUNDRY FOREMAN (34), practical foundryman, experienced grey and alloy iron up to 10 tons, mechanised automobile castings. Extensive experience sand and cupola control. Requires position preferably Yorkshire, Lancashire or East Midlands. Accustomed to working on own initiative. Box FF728, FOUNDRY TRADE JOURNAL.

MANCHESTER based consultant and agent willing to consider further AGENCIES iron and steel, plant and supplies. Full technical representation. Expenses and commission. Principals only. Box MB726, FOUNDRY TRADE JOURNAL.

SKILLED FOUNDRYMAN (38 years) seeks new post. Twenty years' experience all types of foundries, 10 years' supervisory, two years' technical and sales. Good contacts through central England and Midlands. All grades of iron (high duty) and non-ferrous. Prepared to build up run-down business. Midlands preferred. Future prospects are prime consideration. Own car and phone. Available May 1st. Box SF727, FOUNDRY TRADE JOURNAL.

SALES REPRESENTATIVE, Grey Iron Castings. Rep. now with leading company Midlands producing machine bench and floor castings, desires change. Adaptable. Please reply in confidence, briefly indicating proposition to Box SR721, FOUNDRY TRADE JOURNAL.

REPRESENTATIVE, experienced, with reputable company Midlands specializing high duty castings mainly automobile industry, seeks further opportunity. Confidential replies to Box RE722, FOUNDRY TRADE JOURNAL.

PATTERN and experimental non-ferrous MOULDER seeks situation in experimental or production foundry. Match plates, white metal and light alloy patterns. Sampling, etc. M.I.B.F. London area preferred. Box PA725, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

BLACKHEART Malleable Foundry in West Midlands requires an experienced FOUNDRYMAN to organise and operate a mould inspection and quality control section. Experience in malleable foundries desirable, but not essential. Box BM709, FOUNDRY TRADE JOURNAL.

Advertisers whose announcements appear under a box number are urged to acknowledge, however briefly and informally, all replies received. This particularly applies to advertisements under "Situations Vacant"; serious inconvenience and, sometimes, real hardship can be caused to applicants who receive no indication even of the safe receipt of their communication. Failure to acknowledge replies can also reflect on the good faith of this journal, which is responsible for their onward transmission. If it is desired to maintain anonymity, an acknowledgement on plain paper, quoting the relevant box number, is all that is necessary.

SKILLED JOBBING MOULDERS

Immediate vacancies for first class men experienced in machine tool pump and special purpose castings up to three tons in high duty iron. Housing accommodation available if required.

Apply in writing.

High Wycombe Foundry Co. Ltd.,
Chapel Lane, Sands,
HIGH WYCOMBE, BUCKS.

SITUATIONS VACANT—*contd.*

MOULDERS, Jobbing, required for Ferrous and Non-ferrous Foundry. Good rates and overtime. Phone LAD 3692.

ENGINEER required for foundry to take charge of maintenance and development section, excellent position for capable and experienced man. Wages and bonus. Midlands area. Box ER717, FOUNDRY TRADE JOURNAL.

FOUNDRY MANAGER required by Steel Founders and Engineers situated on the North East Coast. Applicants who will have full control must have first class practical and technical experience of the production of castings up to 20 tons by floor, machine and sand-slinging methods. Good experience of sand control is also essential. A contributory staff pension scheme is in operation and a house is available. A good salary will be paid. Applicants should state age and full details of training, experience and positions held, which will be treated in the strictest confidence. Letters should be addressed: DIRECTOR, WOLSINGHAM STEEL COMPANY LIMITED, Wolsingham, Co. Durham.

ASSISTANT FOUNDRY MANAGER

REQUIRED for Malleable Iron Foundry in SOUTH AFRICA with interests in other countries. Applicants should have a sound basic knowledge of malleable cupola practice and be between 25 and 40 years of age.

TECHNICAL ASSISTANT

also required with knowledge of chemical analysis and general malleable foundry practice. Applicants should be between 21 and 30 years of age.

Please reply giving details of past experience and positions held to our LONDON OFFICE.

Both above positions carry good salaries and five years' contract to men with suitable experience.

London Office Address
S.A.P.I.M.A.,
6, Bloomsbury Square,
London, W.C.1.

R. B. TENNENT, LIMITED

Require a Site Development Engineer, to be responsible for the design and construction of their projected heavy foundry. Previous development experience an advantage. This is a senior position and salary will be according to qualifications and experience. Age Group 40/50 years. Superannuation and Life Assurance Schemes.

Applications in writing to :

Personnel Officer:
R. B. TENNENT, LIMITED,
Whifflet Foundry, COATBRIDGE.

SITUATIONS VACANT—contd.

SUPERINTENDENT required for mechanised foundry producing cast iron pipes by sand slinger. This is a permanent pensionable post and assistance can be given with housing if required. Write, giving details of past experience and salary required, to MUNGAL FOUNDRY MANAGER, Carron Company, Falkirk.

EXPERIENCED ESTIMATOR AND RATE FIXER required for Gravity Die and Shell Moulding Departments. Preferably with knowledge of work study. Good commencing salary and working conditions. Contributory Pension Scheme and Employees Share-holding Scheme operated. Canteen facilities. Apply, giving details of age, experience, etc., to: PERSONNEL MANAGER, KENT ALLOYS LIMITED, Temple Manor Works, Strood, Rochester, Kent.

COMPANY producing sand and silica products to specification requires personnel to take charge of the laboratories controlling production and chemical supplies. The plants are located in the Midlands and South of England. Men aged 25-40, with experience and sound technical education up to degree standard are required. The salary paid will depend on qualifications and experience. The men appointed will be responsible to the central technical department at Redhill, where a period of training is envisaged. Apply to RESEARCH MANAGER, BRITISH INDUSTRIAL SAND LTD., Holmethorpe, Redhill, Surrey.

FOUNDRY MANAGER required for steel foundry producing high quality castings up to 7 tons in weight. Applicants must have experience in the control of Moulding Shop, Pattern Shop and Fettling Department. Superannuation scheme in existence and assistance with housing will be available if necessary. Reply stating age, experience, technical qualifications and salary required to: THE MANAGING DIRECTOR, Blackett, Hutton & Co., Ltd., Cleveland Steel Foundry, Guisborough, Yorkshire.

STEEL CASTING SALES

OUR Sales Director wishes to appoint a REPRESENTATIVE to assist with business in the North of England and Scotland. Our Quality Controlled Steel Castings have an excellent reputation with the Engineering industry and our modern Steel Foundry has a high standard of technical competence. The position offers a good salary, pension benefits and progressive conditions include the provision of a motor car. Applicants resident in the Manchester area or the West Riding of Yorkshire—age about 35—should have a sound engineering background but not necessarily previous selling experience. Applications, giving a brief résumé of career to date and particulars of salary attainments, should be written in complete confidence to the PERSONNEL DIRECTOR, K & L Steelfounders and Engineers Ltd., Letchworth, Herts—One of the 600 Group of Companies.

PATTERN MOULDERS required for expanding production. Canteen and baths available. Apply SMITH & WELLSTOOD LTD., Bonnybridge, Stirlingshire.

FOUNDRY TECHNICIAN required, age 26-35. Should have basic training and good technical education including laboratory experience. Experience in copper based alloys essential and the ability to undertake investigations and initiate original development work in the foundry a principal requirement. Salary according to qualifications. Write stating age, qualifications and experience to GENERAL MANAGER, c/o Box FT719, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—contd.

AGENTS required for Non-ferrous Foundry. Sand and gravity die capacity available immediately. Commission basis. Box AR705, FOUNDRY TRADE JOURNAL.

COREMAKER. An experienced Coremaker for large cores required for foundry in West Riding of Yorkshire. Position offers scope for man about 30-40 years with initiative and drive. Give details of experience, age, salary required. Reply to THE MANAGER, Box CM676 FOUNDRY TRADE JOURNAL.

WELL known High Duty and Alloy Ironfoundry in Midlands require: (1) TECHNICAL ASSISTANT for Metallurgical Control, including Electric Furnace. National Foundry College Diploma or equal. (2) METHODS ENGINEER & ESTIMATOR. Box WK724, FOUNDRY TRADE JOURNAL.

BOROUGH POLYTECHNIC, Borough Road, London, S.E.1.

Principal: JAMES E. GARSIDE, M.Sc.Tech., Ph.D., F.R.I.C., F.I.M., F.Inst.F.

The Governors invite applications for the following appointment
DIVISION OF METAL SCIENCE

Head of Division: G. ISSERLIS, B.Sc.(Eng.), A.I.M.

ASSISTANT LECTURER (GRADE B) IN METALLURGY

APPLICANTS should be University Graduates in Metallurgy or hold an equivalent qualification. Industrial and/or Research experience desirable. Experience in the fields of Corrosion and Protection of Metals with special reference to Metal Finishing would be an added qualification. Research encouraged and facilities made available.

Salary Scale: £700 p.a. by annual increments of £27 10s. to £1,150 p.a., plus allowances for training, qualifications and experience, together with the "London Allowance" of £38 or £51 p.a. according to age. Candidates may be placed on the scale at a point appropriate to teaching and/or industrial experience.

Further particulars and Application Form obtainable on application to the undersigned.

FREDK. J. PACKER,
Clerk to the Governing Body.

MACHINERY WANTED

SECONDHAND hand squeeze Moulding Machines required. Please reply giving full details to Box SH720, FOUNDRY TRADE JOURNAL.

MACHINERY FOR SALE

ONE Pneulec No. 375 Jarr Squeeze Stripe Moulding Machine, Serial Number 4339148 and one model R.2 Caleman Core Blowing Machine, Serial No. 6517/R2. Box OP716, FOUNDRY TRADE JOURNAL.

ONE "Major" Sand Rammer and Vertical Skip Loader. 2 ft. 6 in. head, 18 in. dia. with hopper, feeder belt conveyor, magnetic separator. A considerable quantity of spare parts is also available. Apply: MAGNESIUM ELEKTRON LIMITED, P.O. Box No. 6, Lumm's Lane, Clifton Junction, Swinton, Manchester.

MACHINERY FOR SALE—contd.

SAND MIXERS and DISINTEGRATORS for Foundry and Quarry: capacities from 10 cwts. to 10 tons per hr.—W. & A. E. BREALEY (MACHINERY), LTD., Misterton, nr. Doncaster. Tel.: Misterton 202.

TWW

COLEMAN WALLWORK WT563 Jolt Squeeze Straight Draw Moulding Machine, 22½ in. × 19 in. table.
Coleman Wallwork WT563C Jolt Squeeze Straight Draw Moulding Machine, 35 in. × 24 in. table.
Type HPL3 Jolt Squeeze Pattern Draw Moulding Machine by B.M.M., table 36 in. × 25 in.
Macnab Rollover Pattern Draw Moulding Machine, table 46 in. × 50 in.
Coleman Wallwork WT562C Jolt Squeeze Turnover Moulding Machine, table 35 in. × 24 in.
RD2 Model V245 Jolt Squeeze Turnover Moulding Machine by B.M.M. Table 36 in. × 25 in.
Sand Slinger, 9 ft. radius, with three motors, 400/3/50, by Foundry Plant & Machinery Co.
Linslade No. 1 Sand Slinger, 10 ft. radius by Foundry Equipment Co.
August No. 3 Sand Mill, pan 8 ft. dia. × 4 ft. deep, cap. 10/15 ton hr.
Motor Driven Hexagonal Rumbling Barrel, 30 in. across the flats × 48 in. long, 12½ h.p. Motor and Starter, 400/3/50.
Motor Driven Cleaning and Polishing Rumbling Barrel, 26 in. across flats × 38 in. long. Motor drive.
10 ton Collin Geared Crane Ladle.
New Geared Foundry Crane Ladles (10-cwt. to 3-ton cap. in stock).
Air Compressors both new and second-hand, Cupola Blowing Fans, Dust Extraction Fans, Shot Blast Equipment, etc.

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ALBION WORKS : SHEFFIELD
'Phone. 26311 Ext. 307

Remember · Wards might have it!

Abrasive Development Aqua-Spray, wet type blast machine. Almost new.
Southbend 5 in. centre lathe. New and unused. Cheap.
Two modern Rumbling Barrels 6 ft. by 3 ft. motorised.
Large stock of geared ladles up to 8 tons capacity. List on request.
Few Roper ladles and Roper ladle hoists, 3- and 5-cwt. capacity.
New Bale-out and Lift-out furnaces. Please send for illustrated leaflets.
British Moulding machine size A.T.O.S.
Large stock of small moulding boxes at low prices to clear. List on request.
Several Cummings coke-fired furnaces.
Cummings oil sand mixer.
Two Pneulec jolt squeeze moulding machines.
Large stock of Morgan Tilting furnaces.
200 assorted Keith Blackman Fans.
Salter 2-ton Dial crane weighing machine. Just received from the makers.
Suspended Electric Sieve.
Please write for new stock list.

ELECTROGENERATORS LTD.

Australia Road, Slough, Bucks.
Tel.: Slough 22877 & 22094

MACHINERY FOR SALE—*contd.*

FOR SALE. Cupola, 3 ft. dia., water cooled. Complete with fan. New 1957. Box CF670, Foundry Trade Journal.

FOR SALE. Morgan 500 lb. Al. Oil Fired Tilting Furnace, complete. Apply: Frank Salt & Co. Ltd., Station Road, Blackheath, Birmingham.

MOULDING MACHINES

B.M.M. Type RDO. Jolt Squeeze turnover patt. draw, table 26 in. × 18 in.
B.M.M. Type AT5 turnover patt. draw, table 36 in. × 25 in.
B.M.M. Type TO3 hand squeeze turnover table 30 in. × 20 in.
ADAPTABLE Hand Ram, large sizes.
OSBORN 704L. Jolt Squeeze stripper, patt. draw 8 in.
Britannia Pneu. Jolt Lift size No. 2, table 22 in. × 25 in.
Molineux X1 pin lift patt. draw shockless compressed air rapid combination jolt.

ROLLER CONVEYOR

14 in. wide, 2½ in. dia., 4 in. pitch, 8 ft. lengths.
18 in. wide, 2½ in. dia., 4 in. pitch, 10 ft. lengths.

All types Foundry Plant in stock.

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'Phone: Tipton 2448

CORE DRYING OVENS

Maker: Modern Furnaces & Stoves Ltd., Birmingham

CONSISTING of three stoves each 6 ft. 3 in. high, 4 ft. 9 in. wide and 3 ft. 6 in. deep, coupled by common fire passage at floor level to a coke fired furnace 4 ft. high, 5 ft. wide and 3 ft. 6 in. deep.
Total floor area 70 sq. ft.

STOVES: 63 cubic feet capacity each. Double doors with mounted thermometer. Provision for 20 shelves. 7 in. flue outlet at top of each oven centrally for separate control.

FURNACE: Coke hand fired. Ash pit 3 in. above floor level. Forced draught by electric motor driven fan mounted on top of furnace.

MOTOR: 1 h.p., 2,890 r.p.m., 440 volts, 3 phase.

J. PARKINSON & SON (SHIPLEY), LTD.,
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SHOTBLAST MACHINES

All sizes Rooms or Cabinets. Ex stock or prompt delivery. Low prices.

Try us for
Spare parts & tungsten carbide nozzles.

Fully illustrated Catalogue free on request

Actual Manufacturers:
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AUSTRALIA ROAD, SLOUGH
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40 years of satisfactory service

MACHINERY FOR SALE—*contd.*

PAN MILLS, 4 ft. and 5 ft. dia. underdriven, stationary pans, self-discharging, new, for delivery from stock. W. & A. E. Brealey (Machinery) Ltd., Misterton, nr. Doncaster. Tel. Misterton 202.

FOR SALE.—Two Sommerfield Airless Shotblasting Machines. Suitable continuous or batch cleaning of light castings, etc. Running order. Box TS707, Foundry Trade Journal.

FOR SALE. Three-ton Butters Single Motor Electric Derrick Crane with 95 ft. Jib. Fitted with 20 b.h.p. Motor, 4-440 volts, 3 phase, 50 cycles. New 1953. Complete with coach built cabin. Box TT718. Foundry Trade Journal.

1956 FULLY powered mobile Sand Slinger by Foundry Plant and Machinery Ltd. Maximum radius 17 ft. 6 in., 9 tons capacity sand hoppers. Complete and in perfect working order. Lawford Plant & Machinery Ltd., Manningtree 365.

FOR SALE.—Rotary Furnace, Monometer, 2-ton capacity, complete with recuperator, spare shell, fuel tank, all control gear. Little used. Box RF723, Foundry Trade Journal.

HEENAN & FROUDE Oil Cooling Tower, complete unit, 4 ft. 6 in. × 4 ft. 6 in. × 9 ft. high. Whitefield Machinery & Plant Limited, 48 Chatham Street, Edgeley, Stockport.

B.M.M. S.F.2 Moulding M/Cs.
One Rowland Cutting Off M/C.
Jackman 602 Moulding M/Cs.
Two Luke & Spencer D.E. Grinders, 24 in.
Wallwork WT. 562A Moulding M/Cs.
Two Swing Frame Grinders.
Jackman 5 ft. Sandmill.
Jackman 4 ft. Shot Blast Cabinet with In-built Dust Arrestor and Compressor.
Spermalin 2 cwt. Sand Mixer.
Ladles from 2 cwt. to 5 ton, all Geared.
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Four small Jolters.
Noble & Lund 30 in. Horizontal Band Saw.
Pneulec 861 Moulding M/C.
10 ton Barnsley 25 ft. 6 in. span, 2 girder All Electric Overhead Travelling Crane, 400/3/50.
3 ton Stringers approx. 48 ft. span, single girder All Electric Overhead Travelling Crane, 400/3/50.
3 ton Morris Electric Hoist Block with Hand Geared Travel.
Apply

FRANK SALT & CO. LTD.,
Station Road, Blackheath, Birmingham
Tel.: Blackheath 1635

Roper
LADLES
STOCK UP TO 5TON CAP.
E. A. ROPER & CO. LTD.
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WANTED URGENTLY—Up to 2,000 ft. run of secondhand "Stelcon," Type A, 8 ft. × 2 ft. retaining wall, in good condition. Replies to Muntons & Fisons, Ltd., Cedars Factory, Stowmarket, Suffolk.

WANTED

SCRAP ELECTRODE CARBONS
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details of tonnages and samples to

FINE GRINDING LTD
Blackhole Mine, Eyam, Derbys.
Phone: Eyam 227

WANTED URGENTLY

Discarded Sacks, Slag Bags, Old Sacking.

For good prices and prompt settlement sell to actual users.

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FOR SALE. Derbyshire White Ganister. For cupola lining and unlimited other uses. For free samples and analysis write: W. H. Kirkham & Sons, Ganister and Silica Quarries, Pike Hall, near Matlock. Tel. Parwich 232.

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LONDON, S.W.1 TEL: ABBey 6255/6

MATERIALS FOR SALE—*contd.*

FIREWOOD for Cupolas, Sleepers and Sleeper Wood in wagon loads.—TRACK SUPPLIES & SERVICES LTD., Haversham Bank Sidings, Wolverton, Bucks.

MANURE. Processed Foundry Manure. Higher permeability, greater strength, lower cost. Delivery by road ex stock. GINSTER BROS., Walsall. Tel. 27367.

MAY we quote you for Spent Hop Manure? Regular supplies. Road deliveries. SMALLMAN, Oakham Road, Dudley 52818.

TENDERS

The Office of the Indian Railways, Chittaranjan Locomotive Works, Chittaranjan, West Bengal, India, invites tenders for the supply of the following plant for the Steel Foundry with an initial annual capacity of 7,000 tons of castings to be expanded to 10,000 tons per annum.

TENDER No. SFM-60/09/5-A.
Due Date: 28.7.61. Cost: £3 15s. 0d. per tender.

Sand system comprising units:
(i) Reception, (ii) Preparation, and (iii) Knock-out.

2. TENDER No. SFM-60/09/6-A.
Due Date: 28.7.61. Cost: £3 15s. 0d. per tender.

Cleaning Plant comprising units:
(i) Cabinet type airless cleaning plant (bogie type).
(ii) Room type shot blast plant.
(iii) Twin table type airless cleaning plant.
(iv) Tumbler type airless cleaning plant, with alternatives for units.
(a) Hydraulic fettling plant and (b) Conveyor type airless cleaning plant.

3. TENDER No. SFM-60/09/13-A.
Due Date: 28.6.61. Cost: 15s. 0d. per tender.

Electromagnets, 43 in. dia. capacity. Quantity 4 Nos.

4. TENDER No. SFM-60/09/11-A.
Due Date: 28.7.61. Cost: £1 17s. 6d. per tender.

Mobile sand slingers. Ramming capacity 20 cu. ft. per minute. Quantity 2 Nos.

Specifications, etc., relative to the above tender, enquiries can be obtained from the Co-ordination Branch, India Store Department, Bromyard Avenue, Acton, W.3. The cost of the tender sets are as indicated above and are not refundable. Tenders are to be returned direct to The General Manager, Indian Railways, Chittaranjan Locomotive Works, Chittaranjan, West Bengal, India, so as to reach him by the dates indicated above.

Specimen copy of these tender documents can be seen at the Engineering Branch, India Store Department, Bromyard Avenue, Acton, W.3, under the following reference number S.4187 60 NSC Eng.2.

BUSINESS OPPORTUNITIES

CASTING WEIGHTS estimated from customers' drawings. Prompt postal service. Nationwide coverage. ELCO, 30, Calthorpe Road, Walsall, Staffs.

LIMITED NUMBER of firms interested in German "Kollenguss" (brass gravity diecasting) ideal cocks, valves, water fittings, etc., requiring "know how" and A-Z of process. Contact Box LI677, FOUNDRY TRADE JOURNAL. All replies vetted.

ALUMINIUM DIE-CASTING. High pressure precision. Engineering group seeks financial interest in works, capable of absorbing annual turnover up to £200,000. Essential details to Box AD700, FOUNDRY TRADE JOURNAL.

JOBBING IRONFOUNDING AND ENGINEERING

Old established but modern works in prosperous Lancashire town.
Well situated and substantial freehold land and property. Area of land 6/7,000 square yards.
Regular trade with varied long standing connections. High quality irons. Capable of expansion. Foundry capacity 15 tons weekly plus.
Recent Valuations. Majority of shareholders wish to retire on account of age. Taxation loss available. Amalgamation with public company would be considered.

Replies from principals or solicitors to E. & B. HAWORTH & NUTTALL, Solicitors, 7, Lord Street West Blackburn, Lancs. Tel.: 4386/7.

CAPACITY AVAILABLE

CAPACITY available for copper base and light alloy castings. Copper base up to 8 cwt. in weight, light alloy up to 2 cwt. in weight. Enquiries invited. LEWIS FOUNDRY CO. LTD., Pencoed Works, Bynea, Llanelly, Carms.

H. BROADBENT & SON, LTD.

Repetition Castings in Iron and Steel
Competitive Prices on work up to 5 cwts suitable for mechanised plant.

PARK ST. FOUNDRY, ASHTON-UNDER LYNE.
Telephone 3681

CAPACITY AVAILABLE—*contd.*

VITREOUS ENAMELLING.—Capacity available for enamelling castings in all finishes (plain, mottle, marble, lustre, etc.). Prompt delivery by our own transport. THE RUSTLESS IRON CO., LTD., Trico Works, Keighley, Yorks. Tel.: Keighley 3737

CAPACITY available for Iron and Steel Castings. Sand and Shell Moulding, pattern making capacity. Enquiries invited: KNETS CASTINGS, LTD., Station Road, West Horndon, Essex.

HEAT TREATMENT of Iron and Steel. Annealing, Normalising, Stress Relieving and Shotblasting. Prompt delivery by our own transport. THE RUSTLESS IRON CO., LTD., Trico Works, Keighley. Tel. Keighley 3737.

PATTERNMAKERS

PATTERNS for all branches of Engineering for Hand and Machine Moulding.—FURNESTON & LAWLOR, LTD., Letchworth.

FOR successful castings from your plant. Pressurecast matchplates, precision wood or metal pattern equipment can be purchased quickly, competitively, from BOOTH BROS. ENGINEERING, Baggrave Street, Leicester. Tel. 67020.

HENRY CLUETT & CO., LTD.—Patterns of all types in Wood, Metal and Epoxy Resin. Quotations by return. Quick delivery. Furlong Road, Tunstall, Stoke-on-Trent. Tel. 87822.

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Phone: Hockley (Essex) 337
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WOOD AND METAL PATTERNS. HYDRAULIC DUPLICATING.
PATTERNS FOR SHELL MOULDING. EPOXY RESIN PATTERNS.
GRAVITY DIES.

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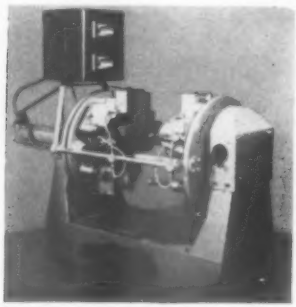

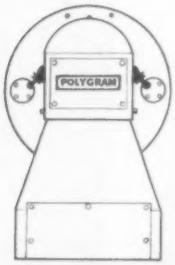

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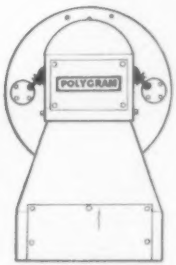

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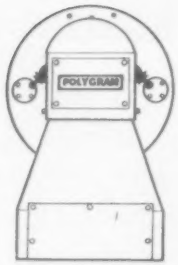

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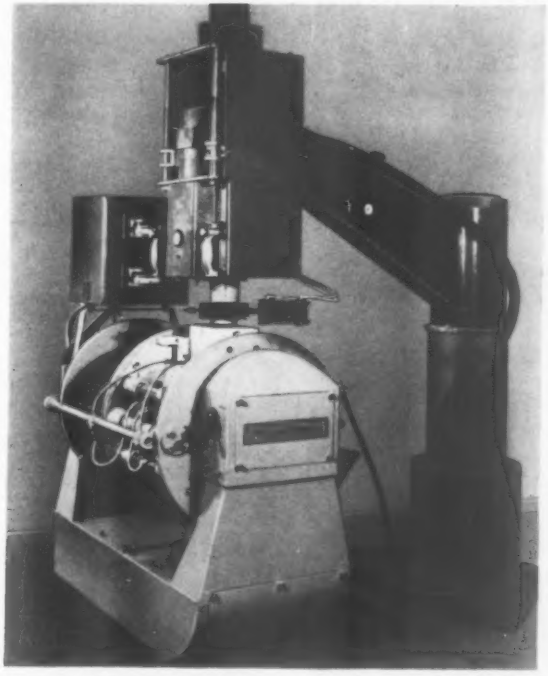

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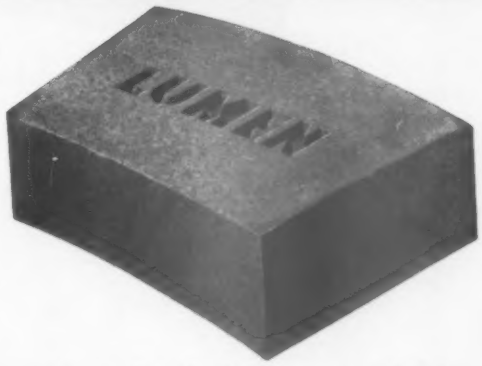

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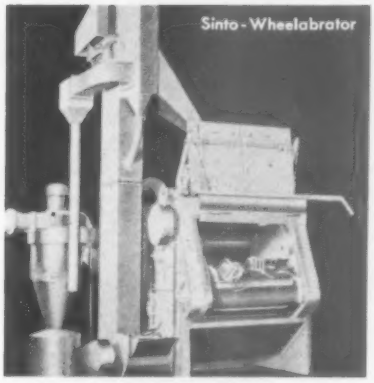

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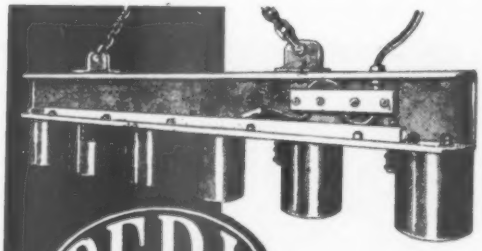

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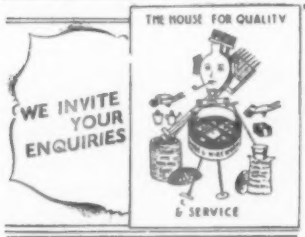

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Above: Mould half for a 15 ton casting. Cold set Corovit mixes are immensely strong and do not sag.

Below: Corovit rib cores are as accurate as the core boxes from which they are made.

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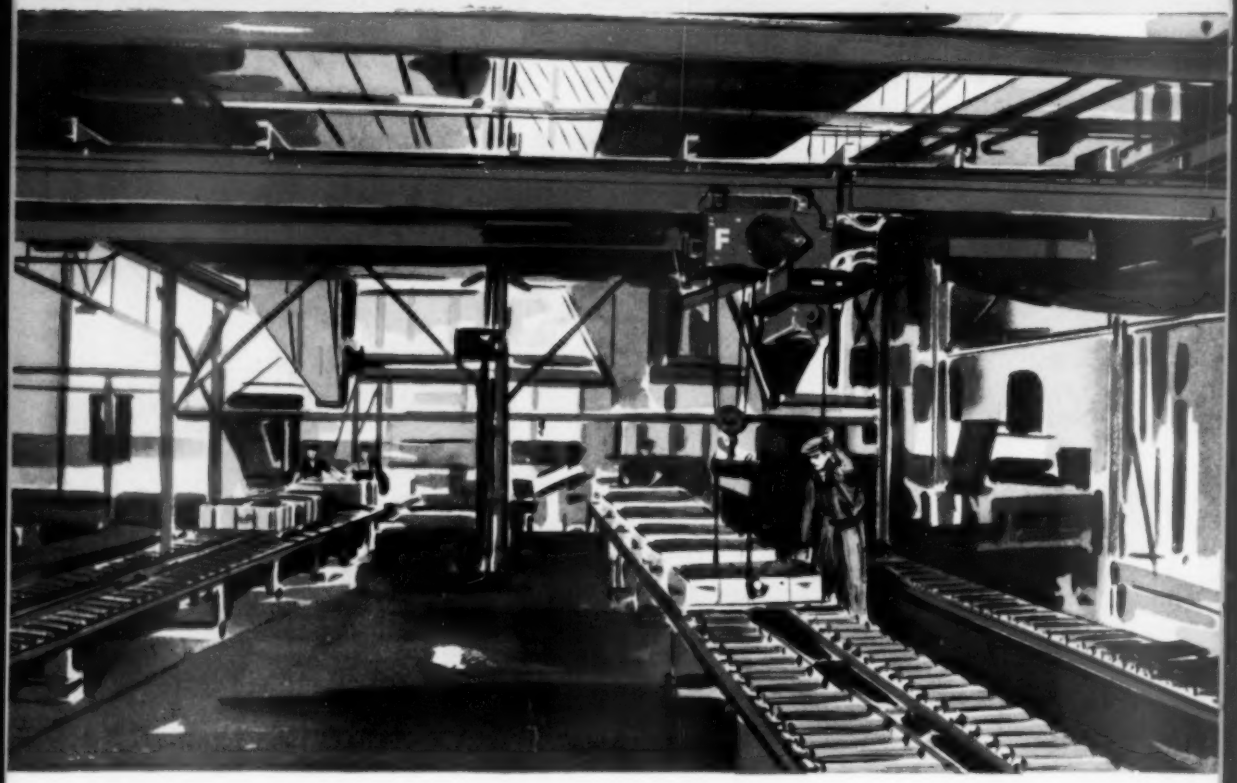

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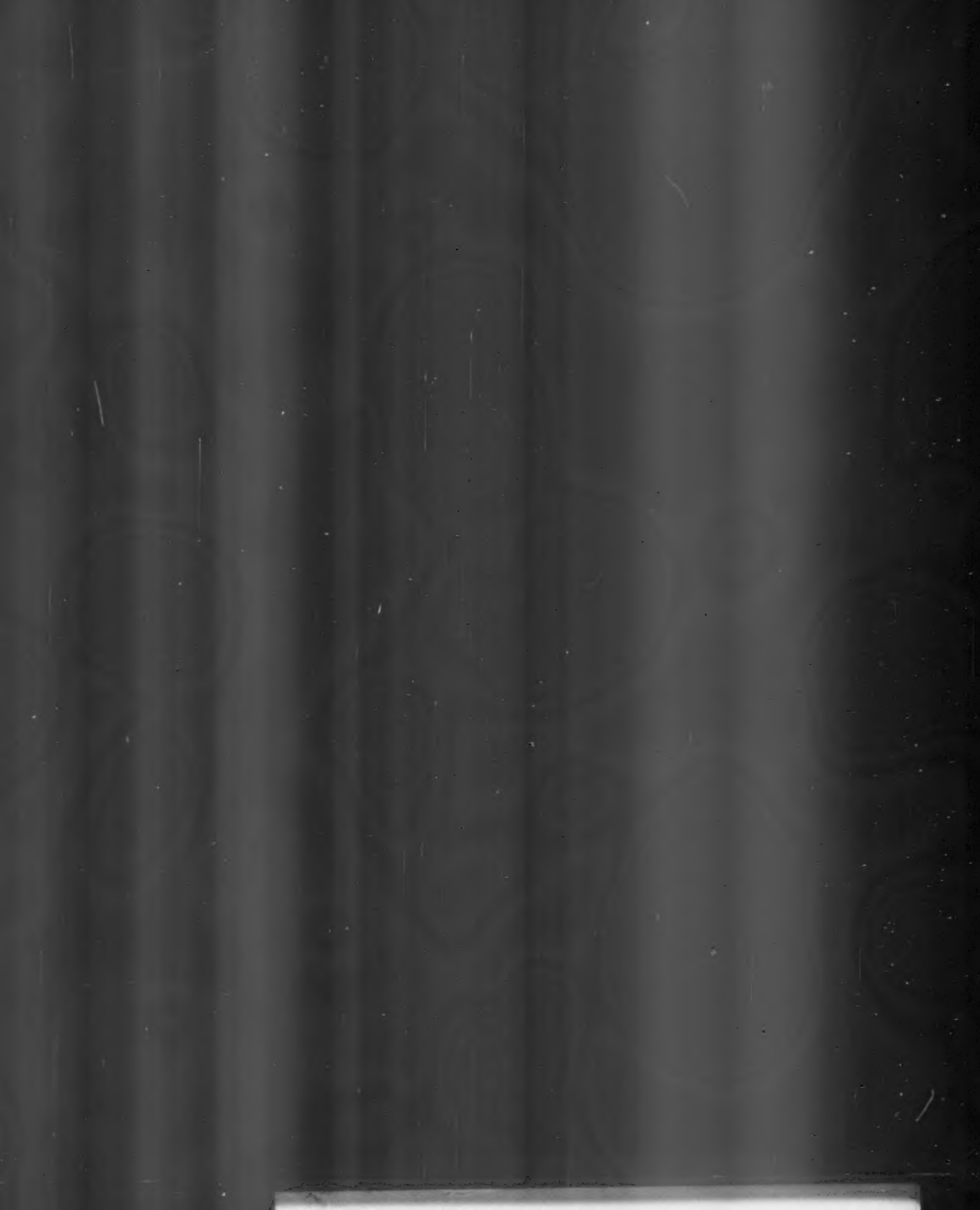
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